Original research article

A Study of Acute Kidney Injury in Medical Wards of Tertiary Care Hospital of South India

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Abstract
Background: In the intensive care units, acute kidney injury (AKI) has been recognized as a distinct risk factor for mortality. The goal of this retrospective study was to identify the risk factors for death in AKI patients as well as the impact of AKI on in-hospital mortality in a general medical ward of a tertiary care hospital.
Methods: A detailed patient's history was obtained, and routine blood tests, such as blood urea, serum creatinine, urine routine, abdominal ultrasound, serology for leptospirosis, enteric fever, peripheral smear for the malarial parasite, and other pertinent investigations, were carried out. Once a diagnosis was made, the therapy was started with the patients' etiological factors adjusted when it was possible.
Results: Based on the etiology of AKI it was found that 56% of cases in the study has pre-renal causes out of which acute gastroenteritis was the common cause in 18% of all the cases of the study. The renal causes were found in 36% of cases and the post-renal causes of AKI were found in 8% of cases. 62% of patients underwent conservative therapy, 24% underwent hemodialysis, and 14% underwent peritoneal dialysis.
Conclusion: AKI is a common prevalent condition that makes hospitalized patients' conditions more difficult to manage. Among the risk factors, this study found diabetes mellitus as the important risk factor for AKI. The common type of AKI was due to pre-renal cause with 56% of cases followed by renal cause in 36% and post-renal was the cause in 8% of the cases. Infections were a significant factor in the development of AKI in cases of our study. High serum creatinine and decreased eGFR were the indicators of poor prognosis.
Keywords: Acute Kidney Injury (AKI), Medical wards, hemodialysis, peritoneal dialysis

Introduction

Acute Kidney Insufficiency (AKI), formerly known as Acute Renal Failure, is a clinical illness characterized by a sudden drop-in glomerular filtration rate that is sufficient to reduce the clearance of nitrogenous waste products (urea and creatinine) and other uremic toxins. [1] Acute kidney injury (AKI) is becoming increasingly prevalent and has a diverse etiological profile. Due to the severity of the underlying condition, it has a large fatality rate and considerable morbidity. Numerous studies have been conducted to assess the prevalence of AKI in intensive

care units and particular circumstances including sepsis, contrast administration, and trauma care settings as well as to define the prognostic markers. [2, 3] It is a well-known fact that, in addition to the main condition causing AKI, the development of AKI is an independent predictor of death and morbidity. [4] The incidence of AKI and its effects on mortality and morbidity in the intensive care unit (ICU) environment have been covered in some Indian studies. [5-7] The clinical profile of AKI in both medical and surgical settings has only been briefly discussed in a few studies. [8-10] Acute kidney injury can range in severity from asymptomatic and temporary abnormalities in laboratory measurements of GFR to overwhelming and quickly deadly derangements in the plasma's electrolyte and acid-base composition as well as its ability to regulate circulating volume. It is crucial to detect AKI early, when it may still be treatable, to stop it from developing into chronic kidney disease. Early detection and potential prevention of AKI are possible. AKI is suspected when hospitalized patients' biochemical monitoring shows a fresh rise in blood urea and serum creatinine levels. Clinical outcomes can be short-term or long-term even with relatively slight changes in renal function. AKI can happen in many different situations, including those involving ambulatory, outpatient, inpatient, and severely ill patients. The ability of the kidneys to recover after almost total loss of function. Most people restore renal function following an episode of AKI, but some may have severe renal impairment and need dialysis. A diagnostic classification system was created in accordance with the range of AKI-related alterations. A more recent classification system known as "Kidney Disease Improving Global Outcomes" (KDIGO) seems to have improved diagnostic sensitivity and outcome-prediction capabilities. [11, 12] Acute kidney injury (AKI) is a syndrome characterized by a quick (hours to days) decline in kidney function. [12] AKI is linked to a 70% increase in mortality risk and a 6.5-fold greater risk of death with a rise in blood creatinine as small as 0.3 mg/dL. After acute MI and stroke, AKI management in non-intensive care settings had the third-highest median direct hospital cost. [13] With this background, we in the current study tried to evaluate the clinical profile of patients with Acute Kidney Injury in the medical wards of our Tertiary care hospital in South India.

Material and Methods

This cross-sectional study was conducted in the Department of General Medicine, Kakatiya Medical College, and MGM Hospital, Warangal. Institutional Ethical approval was obtained for the study. Written consent was obtained from patients or attendants of the patients included in the study.

Inclusion Criteria

1. Males and Females
2. Aged > 20 years
3. Patients admitted to Medical Wards
4. With increased serum creatinine of 0.3 mg/dl from the baseline, Elevation of >50% from the baseline (based on AKI criteria), reduced glomerular filtration rate (GFR), and urine output < 0.3ml/kg/hr for 24 hours or anuria for12 hours (based on failure category of RIFLE criteria of acute kidney injury). [14]

Exclusion Criteria

1. Pregnant females
2. Chronic contracted kidneys
3. Chronic hypertension without proper medications

A detailed patient's history was obtained and recorded in a predesigned proforma and routine blood test, such as blood urea, serum creatinine, urine routine, abdominal ultrasound, serology for leptospirosis, enteric fever, peripheral smear for the malarial parasite, and other pertinent investigations, were carried out. The results of these tests were interpreted. Once a diagnosis was made, the therapy was started with the patients' etiological factors adjusted when it was possible. They received renal replacement treatment in accordance with their clinical and biochemical needs. Patients who experienced an increase in serum creatinine of 0.3 mg/dl or > 50% increase from baseline parameters were followed up and studied.

Statistics: All the available data was uploaded in MS Excel format and analyzed by SPSS Inc. (Chicago, IL, USA; SPSS for Windows, version 19.0). Continuous variables were represented as mean, standard deviation, and percentages, and categorical variables were analyzed by the Chi-square test and a p-value of (<0.05) was considered significant.

Results

In this study, a total of n=50 cases were included out of which 31(62%) were males and 19(38%) were females. Out of the total number of cases, 26% were in the age group 51 – 60 years followed by the age group 41 – 50 years with 20% of the total cases. The mean age of the cases in the study was 53.68 ± 6.47 years. The detailed age-wise distribution of the patients has been depicted in table 1.

Table 1: Demographic profile of the AKI cases in the study

Age in Years	Frequency	Percentage
< 20	5	10
21-30	7	14
31-40	7	14
41-50	10	20
51-60	13	26
> 60	8	16
Total	50	100

The common symptom reported in the group of AKI cases was oliguria in 66% of the cases followed by 26% of cases with fever. Diarrhea and pedal edema was found in 22% and 12% of cases respectively. The distribution of the symptoms reported in the study has been depicted in table 2.

Table 2: symptoms recorded in cases of AKI

Symptoms	Present	Absent
Oliguria	33	17
Fever	13	37
Vomiting	03	47
Diarrhea	11	29
Pedal Edema	6	44
Jaundice	4	46

Type 2 DM is the commonest comorbidity in 42% of cases of AKI followed by hypertension in 34% of cases. 22% of cases had pre-existing chronic kidney disease and NSAID abuse was found in 16% of cases.

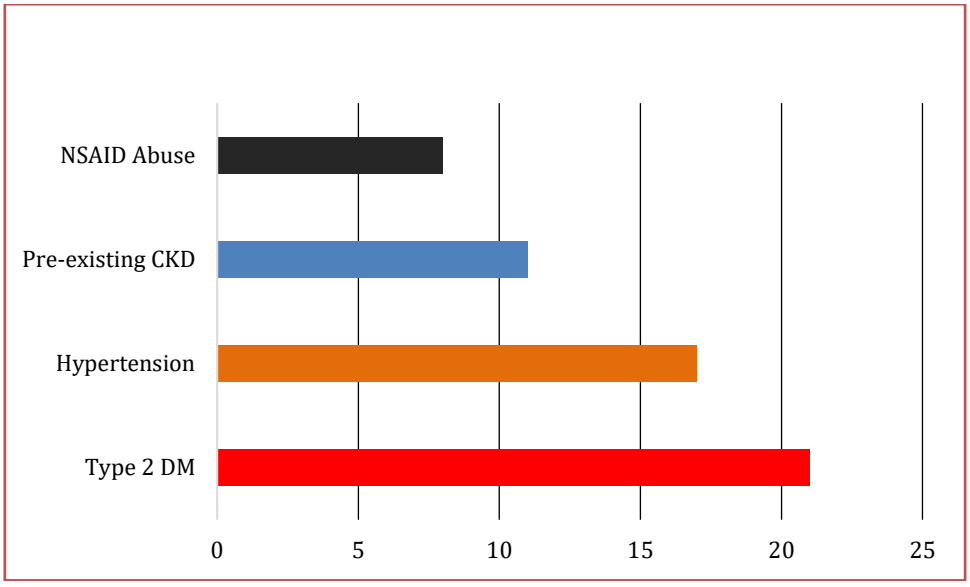

Figure 1: Showing the risk factors for AKI in the cases of the study

Based on the etiology of AKI it was found that 56% of cases in the study has pre-renal causes out of which acute gastroenteritis was the common cause in 18% of all the cases of the study followed by pneumonia in 14% of all cases. The renal causes were found in 36% of cases of study out which complicated UTI was the most common cause. Post renal causes of AKI were found in 8% of cases the detailed distribution of the cases frequency and percentages have been depicted in table 3.

Table 3: Etiology of AKI in the cases of study

Etiology	*Frequency*	*Percentage*
Pre-Renal causes		
Acute Gastroenteritis	9	18
Pneumonia	7	14
Sepsis	5	10
Viral Fevers	4	8
Cellulitis	3	6
Renal Causes		
Complicated UTI	9	18
Poisoning	5	10
Pyelonephritis	4	8
Post Renal causes		
Ureteric calculi	1	2
PBH	1	2
Others	2	4

The estimation of laboratory parameters found that 8% of cases had hyperkalemia. Hyponatriuria was found in 32% of the cases in the study. The serum creatinine values of > 4.0 mg/dl were found in 54% of cases and eGFR was less than 10 in 62% of cases of the study and proteinuria was found in 8% of the cases of study. The detailed distribution of lab parameters has been depicted in table 4.

Table 4: Laboratory parameters in the cases of the study

Lab parameters	*Frequency*	*Percentage*
Serum Potassium levels (mEq/L)		
> 5.2	4	8%
< 5.0	46	92%
Urine sodium (mEq/L)		
< 20	16	32
> 20	34	68
Serum Creatinine (mg/dl)		
< 4.0	27	54
> 4.0	23	56
Estimated GFR (eGFR)		
< 10	31	62
10 – 20	10	20
20 – 30	9	18
Protein urea		
Positive	4	8
Negative	46	92

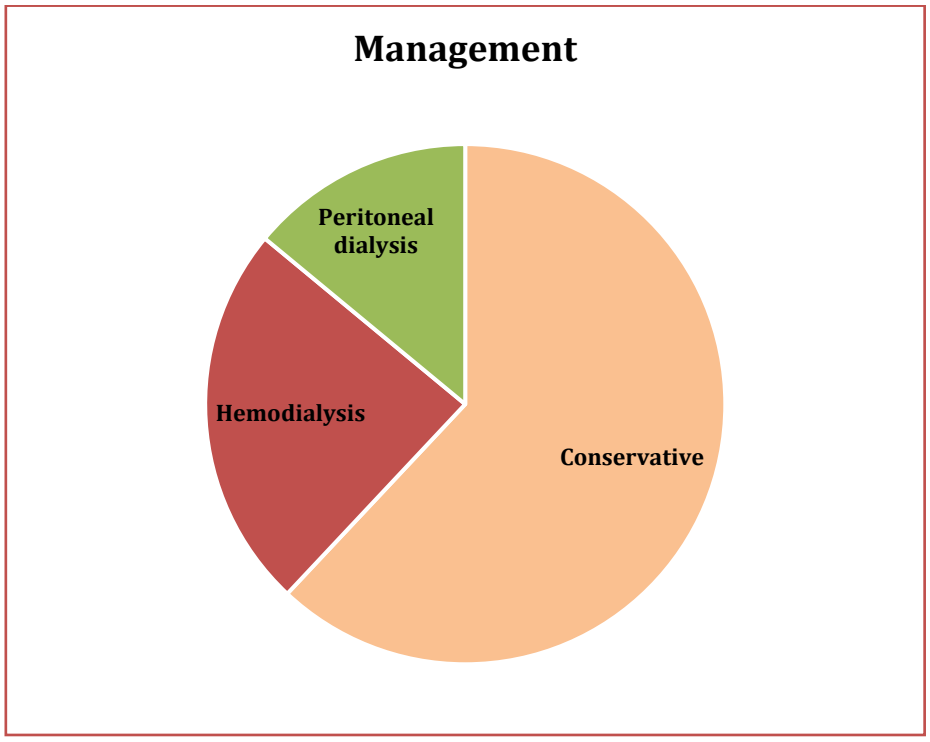

Figure 2: Distribution of cases based on management

In the study 62% of patients underwent conservative therapy, 24% underwent hemodialysis, and 14% underwent peritoneal dialysis. 80% of patients had a complete recovery, 14% made a partial recovery, and 6% of patients died. The majority of patients with intrinsic renal insufficiency recovered completely. The majority of patients who had pre-renal failure only partially recovered. The majority of fatalities were seen in pre-renal AKI. Patients who received conservative care made a full recovery. Patients with eGFR <10 died, but patients with eGFR >10 had a full recovery.

Discussion

AKI is a condition that can be fatal but is treatable. The causes, clinical prognosis, and course vary globally and within individual countries. India's diverse geography, weather conditions, and various living standards of Indian healthcare. This cross-sectional study found out of n=50 cases n=31(62%) were males and 19(38%) were females. Olaga B et al., [15] found 60% of cases of AKI in males and 40% in females agreeing with the observations of the current study. Kapadia MP et al., [16] in their study found a slightly higher prevalence of AKI in males 73% and 27% in females. The mean age of cases with AKI was 53.68 ± 6.47 years. Eswarappa M et al., [2] in a similar study found the mean age of presentation of cases of AKI at 55 years. Similarly, Nagamani et al., [17] in their study found a lower mean age of cases with AKI to be 40.7 years. In this study, oliguria was found in 66% of cases followed by fever in 26% of cases and diarrhea in 22% of cases. Ibrahim et al., [1] found 86.1% of cases of AKI with oliguria Kapadia MP et al., [16] found 93% of cases of AKI with symptoms of oliguria and 81% cases presented with vomiting, and 61% of cases with fever. Shende et al., [18] found the common presentation was vomiting in 80% fever in 56%, and diarrhea in 22% of cases of AKI. In the current study, we found that 56% of cases with pre-renal causes, 36% with renal causes, and 8% were post-renal causes of AKI. Liaño F et al., [19] in their study found pre-renal causes in 21% followed by renal in 58%, and post-renal causes in 10% of cases. F Balushi et al., [20] in n=100 patients, the incidence of pre-renal AKI was 50.9, post-renal obstructive in 4.6% and Renal cause which included acute tubular necrosis (ATN) in the remaining was 44.4%. In this study, 18% of AKI cases were caused by acute GE. It correlated with 21% of people with Type 2 diabetes and hypertension in Kumar et al., [21] the most typical comorbidities that are related. This is consistent with Kumar and others. [19-21] In our country, infections are one of the leading causes of AKI. The majority of these patients' causes were managed conservatively and resumed regular function. At the time of initial presentation, a high serum creatinine level indicated a delayed recovery, and a poor prognosis was noted in cases with high serum creatinine levels and low eGFR.

Conclusion

AKI is a common prevalent condition that makes hospitalized patients' conditions more difficult to manage. Among the risk factors, this study found diabetes mellitus as the important risk factor for AKI. The common type of AKI was due to pre-renal cause with 56% of cases followed by renal cause in 36% and post-renal was the cause in 8% of the cases. Infections were a significant factor in the development of AKI in cases of our study. High serum creatinine and decreased eGFR were the indicators of poor prognosis. Effective management lies in early detection and intervention when the injury is reversible.

References

1. Ibrahim A. Clinical profile and outcome of patients with acute kidney injury requiring dialysis: an experience from a hemodialysis unit in a developing country. BMC Nephrol. 2016; 17:91.
2. Eswarappa M, Gireesh MS, Ravi V, Kumar D, Dev G. Spectrum of acute kidney injury in critically ill patients: A single-center study from South India. Indian J Nephrol 2014; 24: 280-85.
3. Case J, Khan S, Khalid R, Khan A. Epidemiology of acute kidney injury in the intensive care unit. Crit Care Res Pract 2013; 2013: 479730.
4. Rydén L, Hertzberg D, Sartipy U, Holzmann M. Acute kidney injury is a common and serious condition. The clinical significance is great and probably underestimated. Lakartidningen 2016; 113. PII: DXD3.

5. Priyamvada PS, Jayasurya R, Shankar V, Parameswaran S. Epidemiology and outcomes of acute kidney injury in critically Ill: Experience from a tertiary care center. Indian J Nephrol 2018; 28: 413-40.
6. Saxena A, Meshram SV. Predictors of mortality in acute kidney injury patients admitted to medicine intensive care unit in a rural tertiary care hospital. Indian J Crit Care Med 2018; 22: 231-27.
7. Korula S, Balakrishnan S, Sundar S, Paul V, Balagopal A. Acute kidney injury-incidence, prognostic factors, and outcome of patients in an Intensive Care Unit in a tertiary center: A prospective observational study. Indian J Crit Care
8. Med 2016; 20: 332-36.
9. Kaaviya R, Vadivelan M, Balamurugan N, Parameswaran S, Thabah MM. Community-acquired AKI: A prospective observational study from a tertiary level hospital in southern India. Indian J Nephrol 2019; 29: 254-60.
10. Vikrant S, Gupta D, Singh M. Epidemiology and outcome of acute kidney injury from a tertiary care hospital in India. Saudi J Kidney Dis Transpl 2018; 29: 956-66.
11. Chertow GM, Burdick E, Honour M, Bonventre JV, Bates DW. Acute kidney injury, mortality, length of stay, and costs in hospitalized patients. J Am Soc Nephrol 2005; 16: 3365-70.
12. Bhadade R, DeSouza R, Harde MJ, Mehta KS, Bhargava P. A prospective study of acute kidney injury according to KDIGO definition and its mortality predictors. J Assoc Physicians India 2016; 64:22-28.
13. Johnson R, Feehally J, Floege J, Tonelli M. Comprehensive Clinical Nephrology. 6th ed. Philadelphia, PA: Lippincott Williams and Wilkins; 2010.
14. Wiener C, Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J. Harrison's Principles of Internal Medicine. 19th ed. New York, NY: McGraw-Hill; 2012.
15. R. Bellomo, C Ronco, JA Kellum, RL Mehta, P Palevsky. Acute renal failure - definition, outcome measures, animal models, fluid therapy, and information technology needs the Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. Critical Care: The Official Journal of the Critical Care Forum 2004; 8 (4): R204-12.
16. Balafa O, Andrikos E, Tseke P, Tsinta A, Pappas E, Kokkolou E, et al. Outcome and epidemiology of hospital-acquired acute renal failure. Bantao J. 2007;5(2):55-57.
17. Kapadia MP. A study of clinical profile of patients with acute kidney injury in a tertiary care center. Int J Adv Scient Res. 2016;2(8):160-66.
18. Nagamani R, Sudarsi K, Amaravati KS, Khan M, Sakuntala P, Deepthi N. A study on clinical profile of acute kidney injury. Int J Sci Res Pub 2015; 5:28-32.
19. Shende SK, Vikhe VB, Gaikwad Y. Clinical profile of acute kidney injury in intensive care unit in a tertiary care center. Indian J Basic Appl Med Res 2014; 3:511-16.
20. Liaño F, Pascual J. Epidemiology of acute renal failure: A prospective, multicenter, community-based study. Madrid acute renal failure study group. Kidney Int 1996;5 0:811-18.
21. Balushi F, Khan S, Riyami D, Ghilaini M, Farooqui M. Acute kidney injury in a teaching hospital in Oman. Saudi J Kidney Dis Transpl 2011; 22:825-28.
22. Kumar S, Raina S, Vikrant S, Patial RK. Spectrum of acute kidney injury in the Himalayan region. Indian J Nephrol 2012; 22:363-66.