

AETIOLOGY, CLINICAL FEATURES AND MANAGEMENT OF ACUTE KIDNEY INJURY IN A TERTIARY CARE HOSPITAL

Bheemasenachari Moka¹

¹Associate Professor, Department of General Medicine, Government Medical College, Anantapuramu, Andhra Pradesh.

ABSTRACT

BACKGROUND

Acute Kidney Injury (AKI) is a widespread health problem. Major inpatient morbidity and mortality is associated with AKI, reflecting the severity of illness and frequency of complications. Study was done on aetiology, clinical features and management of AKI, this may help many physicians to diagnose AKI in early stage and also to start appropriate treatment.

MATERIALS AND METHODS

A total of 63 patients admitted with/who developed acute kidney injury (AKI) at a tertiary care hospital were included in this study. A detailed history pertaining to AKI was taken before doing investigations and treatment. Clinical examination, investigations, management, outcome of each patient was recorded in a spread excel sheet.

RESULTS

Most commonly, acute kidney injury patients fall in the age group of above 40 years (68.2%). Out of 63 patients, 41 (65.1%) were males and 22 (34.9%) were females. Among various clinical manifestations, most of patients presented with fever (68.2%), oliguria (58.7%), diarrhoea (34.9%), anuria (34.9%), and breathlessness (33.3%). Out of 63 acute kidney injury patients, 20 (31.7%) were drug induced, 17 (26.9%) were due to acute gastroenteritis, 8 (12.6%) were related to sepsis, 5 (7.9%) pneumonia with septicaemia, 3 (4.7%) were due to snake bite with cellulitis, dengue shock syndrome, Super Vasmol poisoning, and 1 (1.5%) was due to pancreatitis.

CONCLUSION

Drug induced, acute gastroenteritis, sepsis are the leading causes of AKI in this community. Acute kidney injury is a potentially reversible condition if identified early and managed properly.

KEYWORDS

Acute Kidney Injury, Clinical Features, Aetiology.

HOW TO CITE THIS ARTICLE: Bheemasenachari M. Aetiology, clinical features and management of acute kidney injury in a tertiary care hospital. J. Evid. Based Med. Healthc. 2018; 5(46), 3223-3227. DOI: 10.18410/jebmh/2018/656

BACKGROUND

Acute Kidney Injury is a widespread epidemic health problem. Major Inpatient morbidity and mortality is associated with AKI, reflecting the severity of illness and frequency of complications.^{1,2}

Acute Kidney Injury is a sudden episode of kidney failure or kidney damage that happens within a few hours or a few days. AKI is defined as Increase in Serum creatinine by 0.3 mg/dl within 48 hours or Increase in Serum creatinine to 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days or Urine volume <0.5 ml/kg/h for 6 hours.³

The definition and staging of AKI are based on the risk, injury, failure, loss, end stage kidney disease (RIFLE) criteria⁴ and the acute kidney injury (AKIN) criteria,⁵ which have previously been defined.

The incidence of AKI has increased in recent years, both in community and hospital settings,^{6,7} approximately 2-3 cases per 1000 persons.⁸ AKI develops in 7% of hospitalized patients and about 2/3 rd of ICU patients, often as a part of MODS.²

Incidence of less severe Acute Kidney Injury (AKI) and AKI treated with renal replacement therapy is approximately 2000-3000 and 200-300 per million populations per year respectively.⁹ The sequelae of AKI were seen in approximately 5% of hospital admissions and up to 30% of admissions to Intensive care units.¹⁰

Many aetiologies of AKI are region-specific such as envenomations from snakes, spiders and bees; infectious causes such as malaria and leptospirosis.¹¹

Variable clinical presentations were seen among AKI patients. Generally, AKI is diagnosed when managing other acute emergencies in intensive care units or while screening routine biochemical investigations.^{1,2} The diagnosis of AKI usually hinges on serial analysis of blood urea and serum creatinine.

Financial or Other, Competing Interest: None.
Submission 20-10-2018, Peer Review 22-10-2018,
Acceptance 29-10-2018, Published 09-11-2018.
Corresponding Author:
Dr. Bheemasenachari Moka,
Associate Professor,
Department of General Medicine,
Government Medical College,
Anantapuramu, Andhra Pradesh.
E-mail: srilathabheemsen@gmail.com
DOI: 10.18410/jebmh/2018/656



AKI may complicate a wide range of diseases, so for the purpose of diagnosis and management, AKI is conveniently sub divided into three categories as prerenal azotaemia, intrinsic renal parenchymal disease and postrenal obstruction.

There is a paucity of data regarding acute kidney injury in this region, so I have selected this study. Study was done on aetiology, clinical features and management of AKI, this may help many physicians to diagnose AKI in early stage and also to start appropriate treatment.

MATERIALS AND METHODS

A Prospective clinical study of 63 patients admitted with or who developed acute kidney injury (AKI) at Department of General Medicine, Government Medical College, Anantapuramu, Andhra Pradesh, during the period of January 2017 to November 2017. Informed consent was taken from all the patients.

Inclusion Criteria

Patients >18 years who satisfy any one of the following criteria

1. Increase in serum creatinine by X 0.3 mg/dl within 48 hours or
2. Increase in serum creatinine to X 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days or
3. Urine volume < 0.5 ml/kg/hr for 6 hours.

Exclusion Criteria

1. Patients with previous renal disease or previous renal transplantation
2. Patients with contracted kidneys.

A detailed history pertaining to AKI was taken before doing investigations and treatment. Clinical examination, investigations, management, outcome of each patient was recorded in a spread excel sheet. Patients were advised to test for routine blood & urine examination, renal function tests, serum electrolytes, daily fluid intake and output measurements, ultrasound abdomen and other tests to find the cause such as dengue serology test, liver function tests, chest x ray, ECG, peripheral smear for malaria etc.,

Patients were managed conservatively or by haemodialysis depending on indication. Indications for haemodialysis include pulmonary oedema, metabolic acidosis, anuria, hyperkalaemia, fluid overload not responding to conservative therapy, and various uraemic conditions like uremic gastritis, uremic pericarditis and encephalopathy.

RESULTS

Most commonly Acute kidney injury patients were fall in the age group of above 40 years, was 68.2%. Only 2 patients were diagnosed as AKI in < 20 years age group.

Out of 63 patients, 41 (65.1%) were males and 22 (34.9%) were females. Male patients were predominantly observed in the age group of 51-60 years i.e., 87.5% followed by 21-30 years i.e., 72.7%. Whereas, majority of the AKI female patients noticed in the age group of 41-50 years i.e., 33.3% followed by >60 years i.e., 22.2% (Table No. 1).

Age in Years	Male	Percentage	Female	Percentage	No. of Patients	Percentage
<20	1	50%	1	50%	2	3.1%
21-30	8	72.7%	3	27.2%	11	17.4%
31-40	4	36.3%	3	27.2%	7	11.1%
41-50	14	66.6%	7	33.3%	21	33.3%
51-60	7	87.5%	1	12.5%	8	12.6%
>60	7	50%	7	50%	14	22.2%
Total	41	65.1%	22	34.9%	63	100%

Table 1. Age and Sex Distribution of AKI Patients

Among various clinical manifestations, most of patients presented with fever (68.2%), oliguria (58.7%), diarrhoea (34.9%), anuria (34.9%), breathlessness (33.3%) followed by abdominal pain (26.9%), anasarca (26.9%), vomiting (23.8%), altered sensorium (19%), jaundice (19%), cough (17.4%), oedema (15.8%). Various clinical manifestations were observed among Acute Kidney Injury patients; these manifestations could be primary signs and symptoms of Acute kidney injury or related to complications of AKI.

On assessing etiological factors of AKI, drug induced, and acute gastroenteritis was found to be predominant. Drug induced acute kidney injury cases were observed mainly due to non-steroidal anti-inflammatory drugs. Out of 63 acute kidney injury patients, 20 (31.7%) were caused by

drug induced, 17 (26.9%) were due to acute gastroenteritis, 8 (12.6%) were related to sepsis, 5 (7.9%) pneumonia with septicaemia patients, 3 (4.7%) were due to snake bite with cellulitis, dengue shock syndrome, Super Vasmol poisoning each, and 1 (1.5%) was due to pancreatitis, hepatorenal syndrome, complicated malaria, carcinoma cervix with obstructive uropathy each (Figure 1).

Sepsis was caused due to various clinical aetiologies including cellulitis with septicaemia, post-operative sepsis, post-partum sepsis, RTA (Road traffic accident) with sepsis, burns with septicaemia.

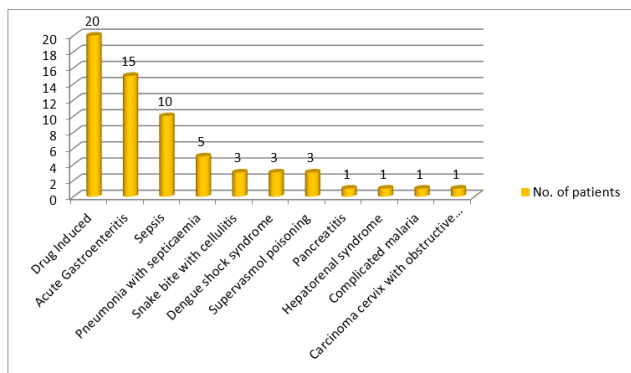


Figure 1. Showing Various Aetiologies of AKI

30 (47.6%) out of 63 acute kidney injury patients were associated with co morbid conditions including diabetes mellitus (33.4%), multiorgan dysfunction (11.1%), hypertension (9.5%), ischemic heart disease (6.3%) and COPD (Chronic obstructive pulmonary disease) (4.7%).

34 out of 63 patients (53.9%) of AKI patients were treated conservatively and remaining 29 patients (46%) required haemodialysis (hyperkalaemia, multiorgan dysfunction, pulmonary oedema, uremic encephalopathy, anuria) (Figure 2).

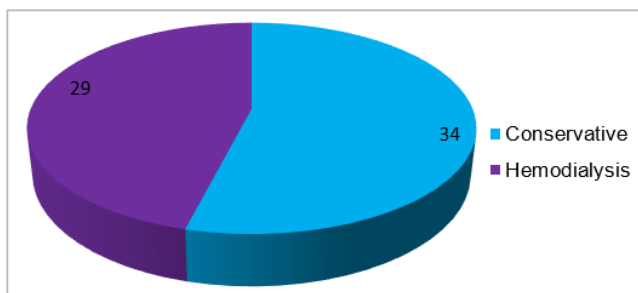


Figure 2. Management of Acute Kidney Injury Patients

Among 63 patients, 22 were improved, 13 were only partially improved and remaining 28 patients died.

DISCUSSION

Acute Kidney Injury (AKI) is a syndrome characterized by a rapid decline in glomerular filtration rate (GFR) sufficient to result in retention of nitrogenous wastes such as blood urea and serum creatinine from protein catabolism, and perturbation of extra cellular fluid volume, electrolyte and acid-base homeostasis.^{1,2}

Impairment of renal functions is a serious complication in critically ill patients. Mortality of patients with oliguric and non-oliguric AKI remains in the 35% to 86% and 10% to 30% ranges respectively despite substantial improvement in haemodialysis techniques.¹² It is noteworthy that a direct relationship exists between the magnitude of rise in serum creatinine level and mortality from AKI.

Most commonly Acute kidney injury patients were fall in the age group of above 40 years, was 68.2%. Only 2 patients were diagnosed as AKI in <20 years age group. Out of 63 patients, 41 (65.1%) were males and 22 (34.9%) were females in this study.

In similar to the present study, Prakash et al¹³ observed the mean age of AKI patients as 44.9 years. Whereas, Bernieh B et al,¹⁴ Singhal AS et al¹⁵ noted the mean age of AKI patient as 56.2 years and 53.5 years respectively.

Bernich B et al¹⁴ reported vomiting, oliguria and anuria as most common presenting features. Singhal AS et al¹⁵ also documented vomiting, oliguria, anuria and fever as commonest clinical manifestations among AKI patients.

Out of 63 acute kidney injury patients, 20 (31.7%) were caused by drug induced, 17 (26.9%) were due to acute gastroenteritis, 8 (12.6%) were related to sepsis, 5 (7.9%) pneumonia with septicaemia patients, 3 (4.7%) were due to snake bite with cellulitis, dengue shock syndrome, Super Vasmol poisoning each, and 1 (1.5%) was due to pancreatitis, hepatorenal syndrome, complicated malaria, carcinoma cervix with obstructive uropathy each in this study.

In the study by Sirwal IA et al¹⁶ in the "profile of acute renal failure in Kashmir valley" which had 78.6% cases due to medical causes, predominant cause was due to acute gastroenteritis accounting for 26.2% of cases in similar to this study.

This study is comparable to Bernieh B et al¹⁴ who found septicaemia causing AKI in 58% of cases, 4% of snake bite with acute kidney injury of Chug KS et al study from Chandigarh¹⁷ and 25% of gastroenteritis associated AKI observed by James Kaufman et al¹⁸ from Boston.

In contrast to present study, Study from Colombo, Sri Lanka stated the leading cause of AKI was snake bite, about 74%.¹⁹

30 (47.6%) out of 63 acute kidney injury patients were associated with co morbid conditions including diabetes mellitus (33.4%), multiorgan dysfunction (11.1%), hypertension (9.5%), ischemic heart disease (6.3%) and COPD (4.7%).

Dana Y Fuhrman et al²⁰ documented 14% diabetes mellitus, 23% hypertension and 12% ischemic heart disease co morbidities were associated with Acute kidney injury.

Urinalysis is the most important non-invasive test in the initial work up of acute kidney injury. Measures of urinary and plasma osmolality, sodium, urea and creatinine are valuable aids to differentiate prerenal azotaemia from intrinsic renal azotaemia. Serum creatinine level is important to compare the patient's current serum creatinine level with previous levels to determine the duration and acuity of the disease. Renal failure index (RFI) and fractional excretion of sodium (FeNa⁺) are very useful diagnostics. Imaging tests can help to rule out obstruction. Renal biopsy is reserved for patients in whom pre-renal and post renal causes of acute kidney injury have been excluded and the cause of intrinsic renal injury is unclear.

34 out of 63 patients (53.9%) of AKI patients were treated conservatively and remaining 29 patients (46%) required haemodialysis in this study.

Measures to correct underlying causes of acute kidney injury should begin at the earliest indication of renal dysfunction. After AKI is established, management is primarily supportive. The key to management is assuring

adequate renal perfusion by achieving and maintaining hemodynamic stability and avoiding hypovolemia.²¹

Acute kidney injury impairs renal excretion of sodium, potassium, and water and perturbs divalent cation homeostasis and urinary acidification mechanisms. In addition, patients are unable to excrete nitrogenous waste products and may develop the uremic syndrome. In general, the severity of complications mirrors the severity of renal injury and the catabolic state of the patient. Acute kidney injury (AKI) is often associated with systemic complications including volume overload; electrolyte and acid-base disturbances, particularly hyponatremia, hyperkalemia and metabolic acidosis; nutritional and gastrointestinal disturbances; anaemia and bleeding diatheses, and increased risk of infection

Among 63 patients, 22 were improved, 13 were only partially improved and remaining 28 patients died. In similar to this study, Mahakur AC et al²² noticed 44% of mortality in AKI patients. Whereas, Mathur A et al²³ found 71% of AKI cases recovered completely, 9% only partially improved and 20% died.

AKI complications are severe and characterized by increased risk of short term and long-term mortality, incident CKD (Chronic kidney disease) & accelerated progression to End stage renal disease. However, early identification of modifiable risk factors for AKI or adverse sequelae has the potential to decrease morbidity and mortality.^{24,25} With appropriate conservative treatment, death is usually due to the primary cause that induced AKI, and rarely a direct complication of uraemia.

CONCLUSION

In the present study, factors predominantly associated with acute kidney injury are male sex, advanced age, fever, diarrhoea, anuria, oliguria and a rise in serum creatinine to >3 mg/dl. Drug induced, acute gastroenteritis, sepsis are the leading causes of AKI in this community. Acute kidney injury is a potentially reversible condition if identified early and managed properly. Because of the morbidity and mortality associated with acute kidney injury, it is important for primary care physicians to identify patients who are at high risk of developing this type of injury and to implement preventive strategies.

REFERENCES

- [1] Brady HR, Singer GG. Acute renal failure. *Lancet* 1995;346(8989):1533-1540.
- [2] Brady HR, Brenner BM. Acute renal failure. In: Kasper DL, Braunwald E, Fauci AS, et al, editors. *Harrison's principles of internal medicine*. Vol. 2. 18th edn. New York: McGraw Hill 2012:2280-2307.
- [3] The Kidney Disease Improving Global Outcomes (KDIGO) Working Group. Definition and Classification of acute kidney injury. *Kidney Int Suppl* 2012;2(1):19-36.
- [4] Bellomo R, Ronco C, Kellum JA, et al. 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. *Crit Care* 2004;8(4):R204-212.
- [5] Mehta RL, Kellum JA, Shah SV, et al. Acute Kidney Injury Network: report of an initiative to improve outcomes in acute kidney injury. *Crit Care* 2007;11(2):R31.
- [6] Hsu CY, McCulloch CE, Fan D, et al. Community based incidence of acute renal failure. *Kidney Int* 2007;72(2):208-212.
- [7] Nash K, Hafeez A, Hou S. Hospital required renal insufficiency. *Am J Kidney Dis* 2002;39(5):930-936.
- [8] Hoste EA, Clermont G, Kersten A, et al. RIFLE criteria for acute kidney injury are associated with hospital mortality in critically ill patients: a cohort analysis. *Crit Care* 2006;10(3):R73.
- [9] Hoste EA, Schurgers M. Epidemiology of acute kidney injury: how big is the problem? *Crit Care Med* 2008;36(4 Suppl):S146-151.
- [10] Lazarus JM, Brenner BM. *Acute renal failure*. 3rd edn. New York: Churchill Livingstone 1993.
- [11] Brady HR, Brenner BM, Lieberthal W. Acute renal failure. In: Brenner BM, Rector FC, ed. *The kidney*. Vol. 1. 8th edn. Philadelphia: Saunders Company 2007:943-968.
- [12] Jochimsen F, Schafer JH, Maurer A, et al. Impairment of renal function in medical intensive care: predictability of acute renal failure. *Crit Care Med* 1990;18(5):480-485.
- [13] Prakash J, Tripathi K, Malhotra V, et al. Acute renal failure in eastern India. *Nephrol Dial Transplant* 1995;10(11):2009-2012.
- [14] Bernieh B, Levy DW, Chaudhuri MD. Pattern of acute renal failure. *Transplantation proceedings* 2003;76:1780-1783.
- [15] Singhal AS, Salkar AR, Chaudhary A, et al. Clinical profile of acute renal failure. *JAPI* 2002;50:70-71.
- [16] Sirwal IA. Profile of acute renal failure in Kashmir valley. *JAPI* 1991;39:81.
- [17] Chug KS, Sakhuja V, Malhotra HS, et al. Changing trends in acute renal failure in third-world countries--Chandigarh study. *Q J Med* 1989;73(272):1117-1123.
- [18] Kaufman J, Dhakal M, Patel B, et al. Community-acquired acute renal failure. *Am Jo Kidney Dis* 1991;17(2):191-198.
- [19] Ramachandran S. In *Acute renal failure in Sri Lanka*. Proceedings of Australian Society of Nephrology, Christchurch, New Zealand 1994: p. 101.
- [20] Fuhrman DY, Kane-Gill S, Goldstein SL, et al. Acute Kidney injury epidemiology, risk factors and outcomes in critically ill patients 16-25 years of age treated in an adult intensive care unit. *Ann Intensive Care* 2018;8(1):26.
- [21] Hakim AL. Acute renal failure in Intensive care unit. *Transplantation Proceedings Diagnosis* 2004;40:1960-1966.
- [22] Mahakur AC, Panda JN, Nanda BK, et al. Malarial acute renal failure. *JAPI* 1983;31:10.

- [23] Mathur A, Lodha N, Gupta A, et al. Profile of acute renal failure. JAPI 1999;47:92.
- [24] Menon S, Kirkendall ES, Nguyen H, et al. Acute kidney injury associated with high nephrotoxic medication exposure leads to chronic kidney disease after 6 months. J Pediatr 2014;165(3):522-7.e2.

- [25] Sutherland SM, Zappitelli M, Alexander SR, et al. Fluid overload and mortality in children receiving continuous renal replacement therapy: the prospective pediatric continuous renal replacement therapy registry. Am J Kidney Dis 2010;55(2):316-325.