

# Study of Etiology, Clinical Profile and Outcome of Acute Kidney Injury (AKI) in Medical Intensive Care Unit

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## ABSTRACT

**Introduction:** AKI complicates 5–7% of acute care hospital admissions and up to 30% of admissions to the intensive care unit and is a major medical complication in the developing world. Objectives: To study etiology, clinical profile and outcome of AKI in medical ICU.

**Material and Methods:** Cross sectional observational study included 50 patients with AKI, a thorough case history, physical examination, routine and specific lab investigations were done to find out the underlying etiology, clinical features and outcome of AKI.

**Results:** Maximum incidence (22%) of AKI was seen in the age group between 25- 30 years. The most common clinical features were vomiting (92%), oliguria (80%), fatigue (72%), fever (70%). The incidence of prerenal, renal and postrenal AKI was 20% 76%, 4% respectively, Malaria(24%) was the predominant cause of AKI in our study. In our study mortality was seen in 10% of the patients, of which most of the patients had septicemia and associated complications like respiratory failure.

**Conclusion:** Early diagnosis and early intervention were probably responsible for good survival rate

**Keywords:** AKI, Malaria, Septicemia, Outcome.

AKI can range in severity from asymptomatic and transient changes in laboratory parameters of glomerular filtration rate (GFR), to overwhelming and rapidly fatal derangements in effective circulating volume regulation and electrolytes, acid-base composition of the plasma. The common clinical features being nausea, vomiting, fatigue, oliguria/anuria, fluid overload, metabolic acidosis, hyperkalemia and altered mental status etc.

The initial care of patients with acute kidney injury is focused on reversing the underlying cause and correcting fluid and electrolyte imbalance. Dialysis is used as an extension of the supportive measure.

AKI is associated with a markedly increased risk of death in hospitalized individuals, particularly in those admitted to the ICU where in-hospital mortality rates may exceed 50%.<sup>3,4,5</sup> Morbidity depends on severity of injury and underlying disease. Other factors influencing patient survival in acute kidney injury<sup>8</sup> includes age, number and severity of coexistent illnesses and associated complications like Intravascular overload, hyperkalemia and other metabolic complications<sup>9</sup> and systemic life threatening complications like cardiac arrhythmia, myocardial infarction, pulmonary embolism, gastrointestinal ulcers, seizures, coma, haemolysis, bleeding tendencies and severe infections. Patients requiring dialysis are at high risk, these risks have changed little in the past 30 years.<sup>10</sup>

Because of the frequent emergency, multimodality presentation and complications of AKI this was the first study done at this tertiary care hospital to know the exact etiology, clinical profile and outcome of AKI so as to take necessary measures to reduce its morbidity and mortality.

## MATERIAL AND METHODS

This cross sectional observational study included 50 patients with acute kidney injury admitted in Government

## INTRODUCTION

Acute kidney injury (AKI), previously known as acute renal failure is characterized by the sudden impairment of kidney function resulting in the retention of nitrogenous and other waste products normally cleared by the kidneys.<sup>1</sup>

AKI is defined as any of the following<sup>2</sup>

- Increase in Sr.Creatinine by 0.3mg/dl ( $\geq 26.5\mu\text{mol/l}$ ) within 48 hours;

OR

Increase in Sr.Creatinine to 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days

OR

- Urine volume  $< 0.5\text{ml/kg/h}$  for 6 hours

AKI complicates 5–7% of acute care hospital admissions and up to 30% of admissions to the intensive care unit.<sup>3,4,5</sup> and is a major medical complication in the developing world, particularly in the setting of diarrheal illnesses, infectious diseases like malaria and leptospirosis, snake bites and natural disasters.<sup>1</sup> AKI may complicate a wide range of diseases. For the purpose of diagnosis and management, it is divided into three categories.<sup>6,7</sup> as prerenal, renal and postrenal AKI with varied causes for each type.

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**How to cite this article:** Md. Yousuf Khan, P. Deepak, A. Praveen Kumar, Krishna Kumar T V. Study of etiology, clinical profile and outcome of acute kidney injury (AKI) in Medical Intensive Care Unit. International Journal of Contemporary Medical Research 2017;4(11):2225-2228.

General Hospital/ Government Medical College Nizamabad, Telangana State, India between November 2016 to October 2017.

### Study Protocol

After taking institutional ethical clearance and written consent from the patients, detailed thorough history taking, general physical examination, systemic examination and routine and specific lab investigations, were done to find out the underlying etiology, clinical features and outcome of AKI. All the patients were followed clinically and biochemically till the time of discharge.

### Inclusion Criteria

All inpatients with clinical and / or biochemical evidence of acute kidney injury.

### Exclusion Criteria

Patients with pre-existing chronic renal failure or chronic renal disease.

Patients aged below 14 years.

## STATISTICAL ANALYSIS

Data was collected in the proforma and processed using Excel software programmes.

## RESULTS

A total number of 50 cases of acute kidney injury patients, admitted to MICU, Government General Hospital/ Government Medical College Nizamabad, Telangana State, India, who met the inclusion criteria were studied.

### Age and Sex Distribution

Out of 50 cases studied, 32(64%) patient were males and 18(36%) were females. Their age ranged from 20 to 65 years with mean age of 48.1years. The Male:Female ratio was 1.8:1. The maximum incidences (22%) of AKI was seen in the age group between 25 to 34 years, Table No.1

Fever was seen in 35 (70%) cases and 16(32%) patient had loose stools, on general physical examination 15(30%) patients had hypotension, 14 (28%) patients had odema and 12 (24%) had icterus, Table No 2.

### Past history

Out of 50 patients, 6(12%) had history of nephrotoxic drug intake.,6 (12%) patients had history of diabetes mellitus and 6 (12%) patients had history of hypertension.

### Type of AKI and Etiology

Out of 50 cases studied, 10(20%) patients had pre renal AKI, renal AKI was seen in 38(76%) patients, and 2(4%) had post renal AKI, Table No.3.

Of the 10 patients who had prerenal AKI 4 patients had acute GE, 5 patients had Malaria and one patient had AKI following septicaemia and of the 38 patients who had renal AKI, malaria was the most common cause seen in 12 patients followed by drug induced AKI(6), septicemia(6) and acute gastroenteritis(5). Of 50 cases 2(4%) patients had AKI following bladder outlet obstruction.

### Management and Outcome

Among 50 cases, 37(74%) patients were managed

Age group	No of Patients		Total (%)
	Male	Female	
<25	2	3	5 (10%)
25-34	6	5	11(22%)
35-44	6	2	8(16%)
45-54	4	2	6(12%)
55-64	7	3	10(20%)
>65	7	3	10(20%)
Total	32(64%)	18(36%)	50(100%)

**Table-1:** Age and Sex Distribution

Clinical Features	Number	Percentage
Vomiting	46	92.00%
Oliguria	40	80.00%
Fatigue	36	72.00%
Fever	35	70.00%
Loose Stools	16	32.00%
Edema	14	28.00%
Jaundice	12	24.00%
Hypotension	15	30.00%

**Table-2:** Clinical Features of AKI

Type of AKI	Etiology	Patients (%)
Pre Renal (n=10)	Acute GE	4 (8%)
	Malaria	5 (10%)
	Septicemia	1 (2%)
Renal (n=38)	Acute GE	5 (10%)
	CCF	1 (2%)
	Drug Induced	6 (12%)
	Leptospirosis	3 (6%)
	Malaria	12 (24%)
	Post INF GN	2 (4%)
	Rhabdomyolysis	1 (2%)
	Septicemia	6 (12%)
	Snake Bite	2 (4%)
Post Renal (n=2)	Bladder outlet obstruction	2(4%)

**Table-3:** Type of AKI and Etiology

conservatively and 13(26%) patients underwent hemodialysis. Among the patients managed conservatively 1(2%) patient died and among those who underwent hemodialysis 4(8%) patients died, Table No. 4. Overall mortality was 10%.

## DISCUSSION

In the present study age of the patient ranged from 20 to 70 years, with mean age of 48.1 years, which is lower than findings of Bernie B et al.<sup>11</sup>

In the present study most common clinical features were vomiting (92%), Oliguria (80%), fatigue (72%) and fever (70%), on physical examination hypotension, edema and jaundice were seen in 30%, 28%, 24% respectively Most of the findings were concordant with the previous studies<sup>11,12,13</sup>. In our study, fever was observed in 70% of the patients, this could be explained by higher incidence of AKI associated with infections like malaria, leptospirosis and Acute GE, Table No.5.

In the present study 12% of the patients had AKI following

Mode of treatment	Number (%)	Mortality (%)
Conservative	37 (74%)	1(2%)
Hemodialysis	13(26)	4(8%)
Total	50 (100)	5 (10%)

Table-4: Management and Outcome

Signs and Symptoms	Present Study	Singhal AS et al <sup>13</sup>	Bernieh et al <sup>11</sup>	Liano F et al <sup>12</sup>
Vomiting	92%	85.2%	80%	86%
Oliguria	80%	80%	78%	80%
Fatigue	72%	-	-	-
Fever	70%	68%	-	-
Hypotension	30%	20.6%	52%	32.8
Oedema	28%	-	20%	-
Jaundice	24%	20%	-	-

Table-5: Comparative Studies showing signs and Symptoms

Studies	Incidence of drug induced AKI
Present Study	12%
Hakim et. Al <sup>14</sup>	14%
Arora P et al <sup>15</sup>	14%
Bernieh et al <sup>11</sup>	6%
Singhal AS et al <sup>13</sup>	3%

Table-6: Comparative study of drug induced AKI

drug nephrotoxicity Table No.6, the common drugs were Aminoglycosides, NSAIDs. Lithium induced AKI was seen in 1 patient, 1 patient had received herbal medicine. All patients except one had normal renal function after discontinuation of drug. But patient who had received lithium did not recover. In the present study drug induced nephrotoxicity was observed in elderly age group and these patients had associate pre morbid conditions.

In present study out of 50 patients 48(96%) of the patients had AKI due to a medical cause which could be because of more incidence of infections like malaria, sepsis, leptospirosis, Acute GE and 2 (4%) were due to a surgical cause.

Cause	Present study	Gurucharan et al <sup>16</sup>	Arora P et al <sup>15</sup>
Medical	96%	68%	36%
Surgical	4%	32%	74%

In present study of 50 cases 10 (20%) patients had AKI due to prerenal cause comparable to study done by Liano F et al<sup>12</sup> (21%), of which 5 patients had malaria, 4 had Acute gastroenteritis and 1 had septicemia, however most of this patients had hypotension. Patients were treated conservatively along with specific treatment to treat the underlying disease. 1 patient underwent dialysis. In the present study, 38(76%) patients had AKI due to renal cause. Majority of patients had malaria 12(24%). This could be because, the study was done in a malaria endemic area. Other common presentations were septicemia 6(12%), drug nephrotoxicity 6(12%), leptospirosis 3(6%), snakebite 2(4%), acute gastro enteritis 5 (10%), rhabdomyolysis 1(2%), congestive cardiac failure 1 (2%) and post infectious glomerulonephritis 2(4%) observations similar to Singhal

AS et al.,<sup>13</sup> who found that malaria was the predominant cause of AKI involving about 46% of patients followed by snakebite (20%), acute GE (12%), septicemia (12%), drug nephrotoxicity (3%). However in a study done by Bernieh et al.,<sup>11</sup> septicemia was the predominant cause of AKI seen in 58% patients followed by drug nephrotoxicity, Acute GE and rhabdomyolysis in 12%, 10% and 9% patients respectively. Out of 38 cases, 10 patients underwent haemodialysis, and the rest were managed conservatively. 34 patients had complete recovery of renal functions and 4 patients died. However, those patients who died had septicemia and associated complications like respiratory failure.

In the present study, malaria is the dominant cause of AKI, probably due to its endemicity in the study place. Out of 50 cases, 17(34%) patients had malaria of which P. falciparum was seen in 70% of patients and vivax malaria was seen in 24% of patients and 6% of patient had mixed malaria however Singhal AS et al.<sup>13</sup> in their study found 16% of patients with malaria had AKI, of which 80% patients had falciparum infection and 20% had vivax malaria. All these patients in our study were treated conservatively and resumed normal renal function.

In the present study, about 2(4%) of the patients had obstructive uropathy. This was comparable to a study done by Singhal AS et al<sup>13</sup>, (5%) and Hakim AL et al<sup>14</sup> (9%).

In this present study of 50 cases, 45(90%) patients survived and about 5(10%) patients expired. (2 males and 3 female). Mean age of recovered patients was 48.33 while mean age of expired patients was 46. Among 50 cases, 37(74%) of patients were managed conservatively and 13(26%) patients underwent haemodialysis. Among 37 patients with conservative management, one patient died where as 4 patients died who underwent haemodialysis. The survival rate out of 13 patients who underwent dialysis, was 69.3% (had complete recovery) while 30.7% expired. The survival rate among patients who were managed conservatively was 97.3%. Most of the patients who died had septicemia and associated complications like respiratory failure. this was comparable to a study done by Hakim Al .et al.<sup>14</sup> where 74% of patients were managed conservatively, and 26% of patient underwent dialysis. However 58% of patients survived with conservative management and 48% of patients survived among dialysed patients. However, in a study conducted by Bernieh B et al.<sup>11</sup>, 58% of patients were managed conservatively while 42% patient were managed with dialysis, but they observed 67% mortality in their study. The overall mortality in the present study is 10%. The predominant cause was septicemia and associated complications. The major risk factors affecting prognosis of the patients were presence of multiorgan failure, high baseline serum creatinine levels and complications developed during the course of illness.

## CONCLUSION

Malaria was the predominant cause of AKI in our study. Falciparum malaria was seen in more patients than vivax malaria. Common clinical features being vomiting, oliguria,

fever, jaundice, fatigue, loose stools. Early diagnosis and early intervention were probably responsible for good survival rate. However another descriptive study with a larger sample size is required to increase the power of the study.

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**Source of Support:** Nil; **Conflict of Interest:** None

**Submitted:** 18-10-2017; **Accepted:** 21-11-2017; **Published:** 30-11-2017