



Clinico-Etiological Presentation of Acute Kidney Injury among Females: A Descriptive Observational Study from Tertiary Care Centre, Latur, Maharashtra

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KEYWORDS

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ABSTRACT:

Background: AKI is a common and often devastating clinical syndrome allied with a high in hospital mortality rates. Among survivors, severe AKI requiring dialysis can result in non-recovery or incomplete progressing to chronic kidney disease (CKD). Patients who develop AKI are at considerable risk for the progression of CKD by 1 year following hospitalization, even for the less severe forms of AKI.

Objectives: To study the etiology and clinical presentation of acute kidney injury based on the endemicity of the area. **Methodology:** This prospective observational study was conducted at the VILASRAO DESHMUKH MEDICAL COLLEGE AND HOSPITAL LATUR, a high-volume tertiary care hospital in MAHARASHTRA, India, involving 510 AKI patients as per KDIGO criteria.

Results: Most commonly affected age group in present study was more than 60 years (38.23%). Most common cause of Pre-Renal Acute Kidney Injury in present study was Acute Gastroenteritis (AGE) i.e. 20% followed by infections in 16.5%. Most common cause of renal Acute Kidney Injury in present study was snake bite and unknown bite (18.8%) followed by poisoning (8.2%). Most common cause of post-renal Acute Kidney Injury was pelvic inflammatory disease (PID) and bladder outlet obstruction (1.8%%) each. In present study, out of 510 patients, 81 patients died due to various causes of AKI leading to mortality of 15.88%, in which most common is due to MODS (29.6%) followed by CCF (25.9%). Paraquat poisoning accounted for 14.8% deaths and septic shock for 11.1% cases.

Conclusion: Oliguria, fever, edema and vomiting were commonly observed symptoms in AKI among females in our study. 53.5% patients had pre-renal while 41.2% patients had intrinsic type of acute kidney injury and 5.3% patients had post renal acute kidney injury. Death rate was 18.88% due to AKI.

Introduction

Acute kidney injury (AKI) is one of the major complications in acutely ill patients and imposes significant mortality and morbidity globally.¹ AKI may be present during admission to the hospital or develop during hospitalization.¹ In tropical countries like India,

Acute Kidney Injury, which occurs outside the hospital setting, is due to dehydration, diarrhoea, infections, venomous snakebite, etc.² Within the Indian subcontinent, there is a significant variation in the etiology of AKI reported across distant geographical areas, and the etiologic spectrum has been demonstrated to change over time, ranging from malaria, sepsis,



nephrotoxic drugs, liver diseases to diarrhoea, glomerulonephritis, sepsis, snakebite, and leptospirosis.²

AKI is a common and often devastating clinical syndrome allied with a high in hospital mortality rates.⁴ Among survivors, severe AKI requiring dialysis can result in non-recovery or incomplete progressing to chronic kidney disease (CKD).⁵ Patients who develop AKI are at considerable risk for the progression of CKD by 1 year following hospitalization, even for the less severe forms of AKI.⁶ Recently, there has been rising recognition that even AKI patients with apparent complete recovery remain at risk for progression to CKD.⁷ There are several gaps in our knowledge regarding the pathophysiology and clinical course of AKI, which does not recover.⁸ There is a need to consider competing risk factors when assessing recovery patterns.⁹

However, most studies with available clinical data have had limitations, including being comparatively small and regional, incapable of accounting for crucial confounding factors such as proteinuria, etc.⁷ Such studies also do not permit exhaustive characterization of renal outcome patterns. Timing of renal function recovery after AKI is associated with an increased risk of long-term progression to CKD and also affects survival rates.^{4,10}

There is a necessity to improve the outcomes of AKI partial and non-recovery; however, there is very scanty literature available on the follow-up of these AKI patients.⁸ Further, few studies are available from developing countries. Among those available, majority of them were conducted on hospital-acquired AKIs. Thus, this study was conducted to evaluate risk factors for developing AKI, the pattern of renal recovery, and their outcomes.

Objectives:

To study the etiology and clinical presentation of acute kidney injury based on the endemicity of the area.

Materials and Methods

This prospective observational study was conducted at the VILASRAO DESHMUKH MEDICAL COLLEGE AND HOSPITAL LATUR, a high-volume tertiary care hospital in MAHARASHTRA, India, after institutional ethics committee approval. The study was approved by

the Institutional Review Board at VDGMC, LATUR and patient consent was obtained.

The study was conducted on patients with more than 18 years of age, and those satisfying AKI as per KDIGO criteria were included if AKI was present at presentation or developed within 48 h of hospital admission, labelling them as AKI.²

Inclusion criteria:

Cases fulfill the following criteria-

1. Increase in serum creatinine by ≥ 0.3 mg/dl (≥ 26.5 μ mol/l) within 48hours.
2. Increase in serum creatinine to ≥ 1.5 time's baseline which is known or presumed to have occurred within the previous seven days.
3. Urine volume < 0.5 ml/kg/hr for more than six hours.
4. All female AKI patients aged above 18 years.
5. Pregnancy, Post delivery PNC, ANC. 6. Patient who are willing to be the part of study.

Exclusion criteria:

1. Trauma and accidental case
2. Patients with diabetes mellitus and Hypertension
3. Patients with CKD
4. Patients aged below 18 years
5. Male Patient. 6. Patient not giving consent
7. Post Operative Surgical Patient Post Renal AKI.

Those patients with established CKD, probable CKD with a surrogate marker with imaging showing any structural abnormalities, or bilaterally reduced kidney size less than 8.5 cm or on any form of renal replacement therapy (RRT) were excluded from the study.

The recruitment of patients for the study involved receiving referrals for nephrology consultations from various departments. The inclusion criteria encompassed both out- and in-patient cases within the nephrology department, as well as individuals referred from other wards.

Data abstraction checklists and structured proforma were developed. The information about the patient's demographics, diagnosis, and associated comorbidities



was collected, and laboratory investigation results (creatinine, urea, electrolytes, complete blood count, and liver function tests) were noted. All patients underwent an ultrasonogram of the kidney to note the size and the structural abnormalities.

All participants were followed up and assessed for the outcomes. The patients' clinical examination findings were noted, including the quantification of urine output by 24-h urinary volume and laboratory parameters, such as serum creatinine. Urine analysis was performed to detect proteinuria and microscopic haematuria.

The study endpoints were the achievement of CR or the death of the patient. As per the study by Korula et al.,¹² the minimum sample required was calculated using the formula: $N \geq Z^2(p(100-p))/d^2$, considering the p (prevalence of disease) as 16.1% and margin of error (d) as 5%, at 95% confidence level, the calculated sample size was 372.

Considering the dropout rate of 10% at each follow-up at 7 days, 1 month, and 3 months, respectively, with a total dropout rate of 30%, the minimum sample size required was 510 participants.

The data entry was done in Microsoft Excel, and analysis was done using Epi info software 7.2.2.2. The normality distribution of the data was tested by using the Kolmogorov–Smirnov test. Baseline characteristics and patterns of AKI were presented as numbers and percentages. The quantitative data were presented as means \pm SD.

A bar diagram was used to display the pattern of AKI outcomes at each follow-up period. Univariable Cox regression was carried out to evaluate the effects of potential factors on overall survival.

The multivariable analysis included all the variables with a p-value of by univariable Cox regression. Reduced model selection using Akaike's information criterion was done to build a multivariate model. Multinomial logistic regression was used to calculate the adjusted odds ratio (AOR) following univariate analysis of overall patient outcome. For all analyses, the p-value is taken as statistically significant when it is less than 0.05.

Results

Table 1: Age Wise Distribution

	Frequency	Percent
18-20	24	4.7
21-30	72	14.12
31-40	63	12.35
41-50	75	14.7
51-60	81	15.88
>60	195	38.23

Most commonly affected age group in present study was more than 60 years (38.23%) followed by 50-60 years (15.88%). Least affected age group in present study was 18-20 years (4.7%).

Table 2: Distribution according to clinical symptomatology

	Frequency	Percent
Icterus	120	23.5
Vomiting	174	34.1
Diarrhoea	120	23.5
Fever	171	33.5
Oliguria	225	44.1
Edema	231	45.3
Hypotension	189	37.1
History of poisoning	42	8.2
History of bite	102	20.0

All 510 patients divided according to common presenting symptoms. We noticed that oliguria, edema and vomiting was most common presenting symptoms comprising of 44%, 45% and 34% respectively.

Table 3: Various causes of acute kidney injury in our patients.

Pre-Renal Acute Kidney Injury

CAUSES	Frequency	Percent
Acute Gastroenteritis	102	20.0
Infective (Malaria, Dengue, ARDS,	84	16.5



Pneumonia, Septicaemia, Septic Shock, Viral Hepatitis)		
Congestive Cardiac Failure, Cardiogenic Shock	45	8.8
Liver Parenchymal Disease	24	4.7
Hepato-Renal Syndrome	12	2.4
Alcoholic Liver Disease	6	1.2

Most common cause of Pre-Renal Acute Kidney Injury in present study was Acute Gastroenteritis (AGE) i.e. 20% followed by infections in 16.5%. Dehydration was seen in all acute gastroenteritis related Acute Kidney Injury patients.

Intrinsic Acute Kidney Injury

CAUSES	FREQUENCY	Percent
Bite (Unknown & Snake)	96	18.8
Poisoning (Copper Sulphate, Paraquat, Herbicidal, Unknown)	42	8.2
Drugs	30	5.9
Multiple Organ Dysfunction Syndrome	33	6.5
Other (Pre-Eclampsia, DIC, Pyelonephritis)	9	1.8

Most common cause of renal Acute Kidney Injury in present study was snake bite and unknown bite (18.8%) followed by poisoning (8.2%) in present study. The Whole Blood Clotting Time was prolonged in all bite patients and all were due to vasculotoxic snake bite. Among the 42 cases of poisoning 12 of them had paraquat poisoning

Post-Renal Acute Kidney Injury

CAUSES	FREQUENCY	Percent
Pelvic inflammatory disease	9	1.8
Bladder Outlet Obstruction	9	1.8

Carcinoma of cervix	6	1.2
Uterine Prolapse	3	0.6

Most common cause of post-renal Acute Kidney Injury was pelvic inflammatory disease (PID) and bladder outlet obstruction (1.8%) each in present study and that was due to old age Female patients were more.

Table 4: Distribution according to types of renal failure

TYPES OF RENAL FAILURE	NO OF PATIENTS	PERCENTAGE (%)
Pre-Renal	273	53.52
Renal	210	41.17
Post Renal	27	5.29
Total	510	100

In present study out of 510 patients, 273 (53.5%) patients had pre-renal while 210 (41.2%) patients had Intrinsic type of acute kidney injury and only 27 (5.3%) patients had Post Renal acute kidney injury.

Table 5: Death due to acute kidney injury

CAUSES OF DEATH	NO OF PATIENT	PERCENTAGE
MODS	24	29.6
CCF	21	25.9
PARAQUAT POISONING	12	14.8
SEPTICEMIC SHOCK	9	11.1
HEPATO-RENAL SYNDROME	6	7.4
LIVER PARENCHYMAL DISEASE WITH HEPATIC ENCEPHALOPATHY	3	3.7
UNKNOWN POISONING	3	3.7
STEROID ABUSER	3	3.7
TOTAL	81	100



In present study out of 510 patients, 81 patients died due to various causes leading to mortality of 15.88% of acute kidney injury, in which most common is due to MODS (29.6%) followed by CCF (25.9%). Paraquat poisoning accounted for 14.8% deaths and septic shock for 11.1% cases.

Discussion

We studied Acute Kidney Injury according to KDIGO definition with respect to incidence, different causes of Acute Kidney Injury and outcome in Medicine ward and Medicine ICU of our college and hospital from AUGUST 2022 to FEB 2024.

Demographic variation

Out of 510 patients included in the study with a mean age of 51.76 years with SD of 18.68. We observed a trend towards an increasing number of Acute Kidney Injury cases among OLD AGE patients among female.

In present study youngest age of 18 years and oldest age of 86 years. In accordance with previous literature, present study highlights the potential risk of Acute Kidney Injury in critically ill, elderly patients especially above the age of 60 years. Compared with all admissions, patients with Acute Kidney Injury were found to be older.

Clinical features of acute kidney injury:

A study of common signs & symptoms were made out. We noticed that oliguria, edema and vomiting were most common presenting symptoms comprising of 44%, 45% and 34% respectively. This finding is compared with other studies done by Kumar R. et al., which showed that oliguria and vomiting was seen in 82% and 90% of patients respectively, may be due to Diabetes and CKD cases included. Utkarsh R. et al¹³ study found that edema was seen in 28.5% of patients.

Fever is presentation in 33.5% of patients, similar to other study done by Utkarsh R.P. et al¹⁴, Soren et al¹⁵, 40% of patients had fever in P.K. Bhattacharya et al¹⁶ 52% of patients had hypotension in Bemieh et al¹⁷ Loose stools is presentation in 23.5 % in present study is similar to Soren et al¹⁵.

Causes of acute kidney injury:

Hypovolemia due to diarrheal illness was the cause of Acute Kidney Injury 20% of patients in this study, which

is similar to study done by P. K. Bhattacharya et al. and Soren et al. were 17.3% and 18 % respectively.^{15,16}

That may be due to poor hygiene and lack of health education and most of these patients are inadequately managed at the primary level leading to a greater number of referrals to our tertiary centre. Similarly, a significant decline in diarrhoea related Acute Kidney Injury has been also reported from India by Prakash et al¹⁸

In the present study 18.8% of patients had Acute Kidney Injury due to renal cause due to bite this is because the study was conducted in snake prevalent zone. Acute Kidney Injury due to snake bite is an important cause of community acquired Acute Kidney Injury (CA-AKI) in tropical countries. About 12%- 30% of patients bitten by venomous snakes, primarily vipers, develop Acute Kidney Injury.

Hemorrhage, hypotension, disseminated intravascular coagulation (DIC), intravascular hemolysis, and rhabdomyolysis contribute to the development of Acute Kidney Injury. Enzymatic activities of snake venoms account for direct nephrotoxicity. Immunologic mechanism plays a minor role.

Mortality in snake bite-induced Acute Kidney Injury is 1 %-20%. Early administration of anti-snake venom (ASV) is a vital therapeutic measure. Treatment of established Acute Kidney Injury is largely supportive in nature, renal replacement therapy being the cornerstone. Our snakebite victims were referred from far flung rural areas. Most of the patient visited the traditional healers first or waited to become severely symptomatic. There were delays in seeking treatment at health centers and getting treatment with ASV due to its nonavailability at peripheral health centers. Most of the patients first received ASV at our center.

Most (90%) patients with snake bite-induced Acute Kidney Injury were KDIGO Acute Kidney Injury stage 3 and required dialysis. There is 1.7 % mortality due to snake bite in present study but 6 % in study done by Pulimaddi et al¹⁹. Most of patients develop Acute Kidney Injury due to intravascular hemolysis, rhabdomyolysis, shock, and the direct toxic effects of the venom, and these patients need dialysis and long hospital stay. The mortality rate of patients who experience Acute Kidney Injury has been reported to be as high as 25%.



Since there is no antivenom, treatment in all such cases is essentially supportive.

Next Sepsis remains one of the major contributors of Acute Kidney Injury worldwide. In present study infective causes of Acute Kidney Injury were seen in 15.8% of Acute Kidney Injury population.

This is consistent with Kumar R et al²⁰ In a population-based study with 1811 Acute Kidney Injury patients, sepsis was the most frequent precipitating factor being present in 47% of the cases. In a multicentric study conducted in 81 centers in Australia, sepsis and septic shock accounted for 45.0% of the cases of Acute Kidney Injury. Similarly, in another study from India, sepsis was reported to be the most common cause of Acute Kidney Injury.

These entities have also been documented to be the important causes of Acute Kidney Injury, especially in critically ill patients in a study of 2017 patients from Korea. Sepsis is the most common cause of Acute Kidney Injury in critically ill patients. In our country, infections are one of the leading causes of most of these patients were treated conservatively and resumed normal function.

Tropical infections including Dengue (1.76%) and malaria (1.17%) were also responsible for Acute Kidney Injury cases in the present study. Early diagnosis and adequate treatment was taken by patients so incidence of tropical infections induced Acute Kidney Injury is lower in our area. In present study other common etiology is poisoning (8.8%) similar to Utkarsh R. P. et al. study. Out of poisoning unknown compound poisoning is more common in present study.

Consumption of poisons (like Corrosives, Cuso₄, Paraquat, Rodenticide, Pesticide, Plant poison, Alcohol, Hair dye etc.) was a cause of Acute Kidney Injury in 42 patients in present study. Out of 12 cases of paraquat poisoning reported in Acute Kidney Injury KDIGO stage 3 and mortality of 100%.²¹ The multiorgan involvement with circulatory collapse is associated with 80% mortality. This observation and late referral to our centre may account for the 80% mortality rate seen in our MODS patients. Cardiac causes such as myocardial infarction, heart block, CCF, ARDS with respiratory failure were the causes of Acute Kidney Injury in 8.2% of our patients similar to study done by S Vikrant et al.²²

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