Clinical manifestations of Acute kidney injury: A Prospective Observational Study

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Abstract: *Acute kidney injury (AKI) is a common catastrophic clinical condition encountered in most of the hospitals, associated with poor short and long term mortality and morbidity . "RIFLE /AKIN" criteria is used for diagnosis and classification of AKI Aims and O*
Bjectives : *This study was undertaken to understand about the clinical spectrum of the disease ; common modes of clinical presentations, etiological factors and outcome of AKI and to correlate these features with laboratory findings which may help in diagnostic and prognostic approach for better case management. Method: This prospective study involved 150 patients of AKI admitted in 2 year interval between May 2013 to May 2015.The clinical and laboratory data were recorded and analyzed from admission to discharge .Statistical analysis were done with SPSS version.*
Results : *Intrinsic AKI was seen in 95 (63.33%) patients , 48(32%) and 7 (4.7%) patients had prerenal and postrenal AKI respectively. Malaria was the most common etiology of AKI. Snake bite mentions special attention as it contributed 18 (9.7%) cases of AKI in our study.109 (72.67%) patients of AKI patients were managed conservatively and 41 (27.33%) patients underwent hemodialysis. Mortality was seen in 15(10%) patients and multiorgan failure (MOF) was the important contributing cause.*
Conclusions : *Infectitious disease particularly malaria , septicemia had highest attribution to AKI incidence. MOF ,hemodialysis , hyperkalemia , septicemia were factors affecting prognosis . Early detection of the etiological factor with prompt initiation of treatment helps saving lives of patients of AKI.*
Keywords : *Acute Kidney Injury , etiology ,Snake bite causing AKI*

I.   Introduction

Acute renal failure (ARF) is an important clinical problem complicating 5-7% of hospital admissions and up to 30% of admissions to the intensive care unit. It is characterized by a sudden (hours to weeks) loss of the ability of kidneys leading to decline in the glomerular filtration rate (GFR) and retention of nitrogenous waste products such as blood urea nitrogen (BUN) and creatinine[1,2]**.** Reports from our country are scanty compared to western literature and hence there is need to understand the clinical profile of patients in this part of the country for better management of AKI. ARF is not a single disease but rather is a disease with multiple etiologies sharing common diagnostic features like an increase BUN and/or in serum creatinine (SrCr), often associated with oliguria. In this regard Acute kidney Injury (AKI), synonym to ARF, better justifies the diverse nature of this syndrome[3,4,5].In accordance with the magnitude of changes observed in AKI, a diagnostic classification criteria called 'RIFLE criteria' was developed, which includes three levels of renal dysfunction of increasing severity, namely, (R)Risk of renal dysfunction, (I)Injury to the kidney and (F)Failure of kidney function and two outcome categories: (L)Loss of function, and (E)End stage kidney disease. It is our observation in our centre that late admissions to nephrology unit are associated with development of mutiorgan failure. Infectious diseases like malaria and leptospirosis, diarrheal illnesses, snake bites and trauma[6]are some of the causes leading to AKI.

The causes of Acute kidney injury are divided into three types: Prerenal , Intrinsic and Post renal AKI[6]. Urinalysis and blood biochemistry are useful for differentiating between the major categories of oliguric AKI, namely prerenal and intrinsic AKI caused by ischemia or nephrotoxins. The fractional excretion of Na+ (FENa) is the most sensitive index for this purpose. [7,8] .

In patients with acute renal failure, dialysis is used as an extension of the supportive measures[10]. There is no evidence that dialysis shortens the course in ARF. Dialysis may be hazardous because of episodes of hypotension and arrhythmias. Dialysis is indicated if medical measures fails to prevent the following: pulmonary oedema, hyperkalemia, metabolic acidosis, signs and symptoms of uraemia e.g pericarditis.

II.   Materials And Methods

This study was conducted in a tertiary hospital in Jharkhand state of India. It was a descriptive study with prospective data collection of patients admitted in a tertiary care hospital with a diagnosis of AKI from May 2013 to May 2015. Informed consent to participate in this study was taken from all the patients during the study.

Study design

This study was a prospective observational study over a period of 24 months. A total of 150 patients admitted of AKI were included in this study ,diagnosis confirmed on clinical evaluation and relevant laboratory investigations. They were followed from the time of admission to the time of discharge from hospital.

A. **Inclusion criteria**:
All admitted patients with clinical and biochemical evidence of acute renal failure according to RIFLE criteria .

B. **Exclusion criteria**:
Patients with chronic renal disease and on renal replacement therapy.
Patients aged below 16 years.
Patients with pre-existing nephropathy due to diabetes mellitus or hypertension.

Statistical methods
Descriptive statistics were analysed with SPSS (Software Package used for Statistical Analysis) version 17.0 software. Continuous variables were presented as Mean and Standard Deviation (SD). Categorical variables were expressed as frequencies and percentages. Nominal categorical data between the groups were compared using Chi-square test after construction of 2x2 tables. For numeric variables, Student's t test was used to find the difference between males and females. For all statistical tests, a "p value" less than 0.05 was taken to indicate a significant difference.

III. Results

Out of 150 cases studied, about two thirds of patients were males (62.67%) whereas about one third of cases comprised of females (37.33%) and the male to female ratio was 1.68:1.

1.Clinical features of AKI
Out of 150 cases ,135(90%) had vomiting which was the most common finding and 123 (82%) patients had oliguria. Other common symptoms in chronological order included in table 1.

Table 1: Clinical Manifestations Of Acute Kidney Injury

Signs & Symptoms	Total No. (n=150) n(%)	Male (n=94) n(%)	Female (n=56) n(%)	Chi-square	P value	Significance	
Oliguria	**123(82)**	79(64.23)	44(35.77)	0.711	0.39	NS	
Fever	**105(70)**	65(61.90)	40(38.10)	0.08	0.76	NS	
Vomiting	**135(90)**	87(64.44)	48(35.56)	1.82	0.17	NS	
Loose motions(LM)	**45(30)**	29(64.44)	16(35.56)	0.08	0.76	NS	
Oedema	**40(26.67)**	24(60)	16(40)	0.16	0.68	NS	
Fatigue	**111(74)**	70(63.06)	41(36.94)	0.02	0.86	NS	
Hematuria	**25(16.67)**	14(56)	11(44)	0.56	0.45	NS	
Jaundice	**39(26)**	27(69.23)	12(30.77)	0.97	0.32	NS	
Hypotension	**43(28.67)**	28(65.12)	15(34.88)	0.15	0.69	NS	

Etiology:
Out of 150 cases, intrinsic AKI was seen in 95(63.33%) patients, 48(32%) patients had prerenal AKI and 7(4.7%) had post renal AKI (Graph 1). Among 150 cases studied 48(32%) patients had malaria which was the most common cause of AKI in our study cases are described in following table.

Table 2: Etiology Of AKI

ETIOLOGY	Total No. (n=150) n(%)	Male (n=94) n(%)	Female (n=56) n(%)	Chi-square	P value	Significance	
Malaria	**48(32)**	34(70.83)	14(29.17)	2.01	0.15	NS	
Septicemia	**21(14)**	13(61.90)	8(38.10)	0.006	0.93	NS	
Acute gastroenteritis	**18(12)**	10(55.56)	8(44.44)	0.44	0.50	NS	
Snake bite	**13(8.7)**	8(61.54)	5(38.46)	0.007	0.92	NS	
Drug Induced	**9(6)**	5(55.56)	4(44.44)	0.20	0.64	NS	
PPH	**8(5.3)**	-	8	-	-	-	
Bee sting	**4(2.7)**	3(75)	1(25)	0.26	0.60	NS	

Obstructive uropathy	**7(4.7)**	6(85.71)	1(14.29)	1.66	0.19	NS
Post surgical	**4(2.7)**	4(100)	0(0)	2.44	0.11	NS
Burns	**3(2)**	2(66.67)	1(33.33)	0.02	0.88	NS
CCF	**3(2)**	2(66.67)	1(33.33)	0.02	0.88	NS
HRS	**5(3.3)**	3(60)	2(40)	0.01	0.90	NS
PSGN	**1(0.6)**	0(0)	1(100)	1.68	0.19	NS
Leptospirosis	**2(1.3)**	1(50)	1(50)	0.13	0.70	NS
Pancreatitis	**2(1.3)**	1(50)	1(50)	0.13	0.70	NS
Peritonitis	**1(0.6)**	1(100)	0(0)	0.59	0.43	NS
Multiple myeloma	**1(0.6)**	1(100)	(0)	0.59	0.43	NS

Malaria [48(32%)] was the commonest entity as an underlying cause of AKI. No difference was noticed between males and females as regards to *P.Falciparum* and *P.Vivax (Table 3)*

Table 3: Comparative Analysis Of Malaria

Malaria	Total	Male	Female	Chi-	P value	Significance
	No.	(n=94)	(n=56)	Square		
	(n=150)	n(%)	n(%)			
	n(%)					
P.Falciparum	**36(24)**	25(69.44)	11(30.56)	0.93	0.33	NS
P.Vivax	**12(8)**	9(75)	3(25)	0.84	0.35	NS

Graph – 1: Graph Representing Types Of Aki
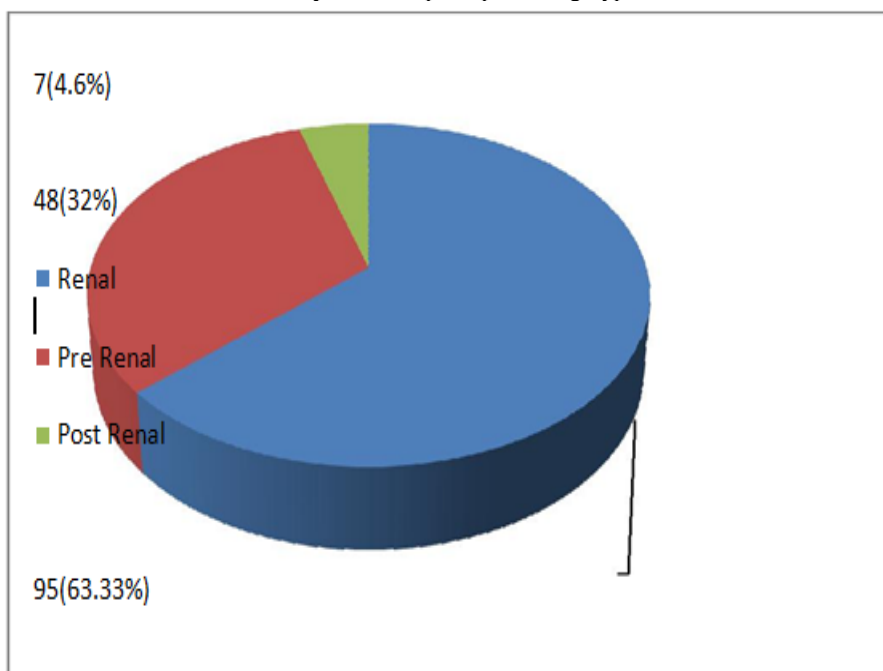
Table 4: Types Of Aki & Diagnosis

AKI	Total No. (n=150) n(%)	Male (n=94) n(%)	Female (n=56) n(%)	Chi-square	P value	Significance	
Prerenal	**48(32)**	25(52.08)	23(47.92)	3.37	0.06	NS	
Renal	**95(63.3)**	63(66.32)	32(33.68)	1.47	0.22	NS	
Postrenal	**7(4.7)**	6(85.71)	1(14.29)	1.66	0.19	NS	

Management:

Among 150 cases, 109(72.67%) patients were managed conservatively and 41(27.33%) patients underwent hemodialysis. Among the patients underwent hemodialysis, 15(10%) patients died.

Table 5 : Modes Of Treatment

| Mode of Treatment	Total No. (n=150) n(%)	Male (n=94) n(%)	Female (n=56) n(%)	Chi-square	P value	Significance	
Conservative	**109(72.67)**	68(62.39)	41(37.61)	0.01	0.90	NS	
Haemodialysis	**41(27.33)**	26(63.41)	15(36.59)	0.01	0.90	NS	

Graph 2: Modes Of Treatment
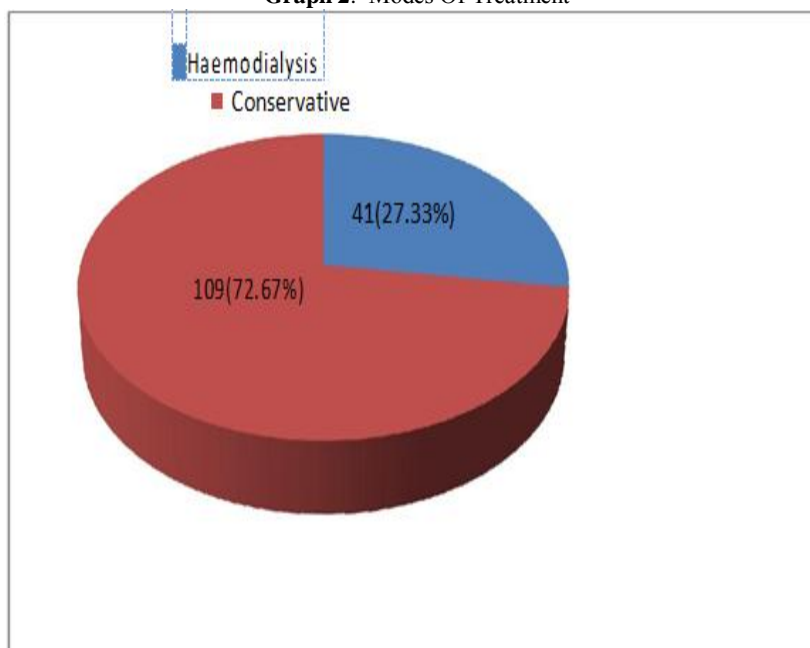
Outcome:

Out of 150 cases studied, 135(90%) patients survived. Mortality was seen in 15(10%) patients. 5 patients died due to AKI following septicaemia,4 patients died due to falciparum malaria, 2 patients due to snake bite (hemotoxic), 2 patients due to post partum hemorrhage (PPH),1 patient died due to AKI following bee sting and 1 due to burns. Multiorgan failure was observed in 28% of females and 46% of male patients.

Table 6: Outcome Of Patients

Outcome of Patients	Total No. (n=150)	Male (n=94)	Female (n=56)	Chi-square	P value	Significance
	n(%)	n(%)	n(%)			
Survived	135(90)	84(62.22)	51(37.78)	0.11	0.73	NS
Expired	15(10)	10(66.67)	5(33.33)	0.11	0.73	NS

Graph3: Outcome Of Patients
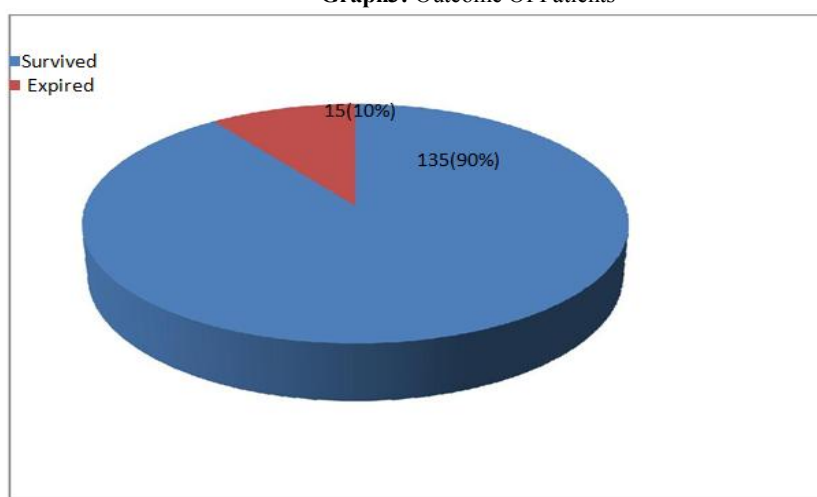
Logistic regression analysis of outcome of AKI:

Factors like age, serum creatinine levels at the time of admission , sex, total bilirubin, haemodialysis and MOF were analyzed by using logistic regression analysis (table 7). Among these ,total bilirubin, haemodialysis and multiorgan failure had significant association with outcome.

Table 7: Logistic Regression Analysis

Parameter	Regression Coefficient	Standard Error	Wald Z-Value(Beta=0)	Wald Prod Level	Odds Ratio
Age	0.03583	0.02555	1.402	0.16078	1.03648
CA	0.08524	0.46778	0.182	0.85541	0.91829
Sex	0.37952	0.77564	0.489	0.62463	0.68419
Total Bilirubin	0.67387	0.71762	0.939	0.34771	1.96181
Haemodialysis	14.6	0.005	2808.50	0.00	1000+
Multiorgan failure	2.06	0.77	2.6	0.008	7.88

IV. Discussion

This study was undertaken to comprehend our knowledge about the spectrum of clinical presentations, etiological factors and to correlate these features with laboratory findings for prompt management of AKI.

The commonest clinical manifestations were vomiting (90%) and oliguria (82%) followed by fatigueness (74%), fever (70%), loose motions (30%), haematuria (16.67%) respectively. On examination, oedema and jaundice were found in 40(26.67%) and 39(26%) patients respectively while another 43(28.67%) patients had hypotension which was the commonest finding.   These findings are comparable with the study conducted by Dev G et al [11], who observed oliguria in 74% of patients, oedema in 28% of patients and jaundice in 21% of patients. In the present study, fever was seen in 70% of patients which was comparable to the findings of Patil TB et al [12] (82.4%) and G Dev et al[11] (52%). This could be explained by higher incidence of AKI associated with infections like malaria, leptospirosis, PSGN (post stretococcal glomerulonephritis) and acute gastroenteritis. Malaria was the commonest cause of AKI in our study as most of the patients hail from tribal areas of Jharkhand, a hyperendemic zone for malaria.

Hypotension was observed in 30% of patients contrary to the study by Dev G et al [11] and Dharod MV et al[13] who reported hypotension among 74% and 8.15% of patients, respectively. In agreement with the findings of Dev G et al [11](28%) and Patil TB et al [12] (33.3%) oedema was observed in 26.67% cases in this study. Jaundice was found in 26% cases which were similar to the study conducted by Dev Get al [11](21%) but in contrast with studies by Emem-Chioma PC et al [14] and Godara SM et al [15] in which, jaundice was noted in 1.6 % and 10.5% respectively. Likewise hematuria was noticed in 16.67% of patients which was comparable to the findings of 29.8%, by Patil TB et al [12]

138(92%) patients had AKI due to a medical cause, 8(5.3%) due to an obstetrical cause and the remaining 4(2.7%) were due to a surgical cause. These findings are in similarity with Dev G et al [11], who reported 85.6% incidence due to medical causes, followed by obstetrical and surgical causes in 8.4% and 6% of patients respectively. Emem-Chioma PC et al [14] reported highest incidence of AKI due to medical causes (70.9%) followed by surgical causes (24.2%) and obstetrical causes (4.8%) which was analogous to our study. Clincal observations reported by Kaul A et al [16] were also in support of our findings in this study. Godara SM et al [15], in their study, showed that about 9.82% of patients had AKI due to an obstetrical cause. Higher incidence of AKI due to medical causes was observed in this study may be due to more incidences of infections like malaria, sepsis, acute gastroenteritis and leptospirosis. Predominant underlying medical disorders causing AKI may be attributed to delayed diagnosis, use of nephrotoxic drugs, co-morbid conditions and septicaemia. Similarly lesser number of surgical cases developing AKI may be due to better pre operative, intra operative and intraoperative care.

The course of stay in hospital and outcome of these patients with AKI is variable. Among 150 cases, 109(72.67%) patients were managed conservatively and 41(27.33%) patients underwent haemodialysis. Conservative management included early detection of the etiology and prompt initiation of treatment. In the present study good results were obtained with conservative management.Our study was comparable to the study done by Kaul A et al[16],where 92.5% of patients were managed conservatively and 7.5%of patients underwent dialysis. However in a study done by Patil TB et al [12], 47.71% of patients were managed conservatively while 52.29% of patients were managed with dialysis.

The outcome of these patients with AKI is variable. In this present study of 150 cases, 135(90%) patients survived and 15(10%) patients expired (10 males and 5 females). Mean age of recovered patients was 45.85 years while mean age of expired patients was 50 years. Among 109 patients with conservative management, no patient died where as 15 patients died who underwent haemodialysis. The survival rate out of 41 patients who underwent dialysis was 63.41% (had complete recovery) while 36.59% expired.

Most of our patients who died, had septicemia and associated complications like respiratory failure. The major risk factors affecting prognosis of the patients were presence of multi organ failure (28% among females and 46% among males), high baseline serum creatinine level and complications developed during the course of illness. In the present study, mortality was seen among the patients who had high serum creatinine at admission as compared to survived patients. Low mortality observed in this study may be due to large number of patients with medical acute renal failure, early diagnosis and treatment.

The survival rate in our study (90%) was comparable with other studies like Patil TB et al [12] (70.17%) and Bagasha P et al [17] (79%). The mortality in our study (10%) is similar to study done by Bagasha P et al [17] (21%) but in variance with other studies conducted by Samimagham HR et al [18] (72.6%) and Patil TB et al [12](29.8%). GCS and APACHE II score on admission to the ICU were significantly higher in the expired patient. So, the mortality rate in this study was higher compared to other studies.

V. Conclusion

From this study it is observed that majority of the patients affected by AKI are in the age group of 30 to 60 years. Vomiting was the commonest presentation closely followed by oliguria. Highest incidence of AKI was attributed to medical disorders consisting of mainly malaria, septicemia, acute gastroenteritis and snake bite. MOF, hemodialysis, elevated total bilirubin, septicemia and hyperkalemia were the factors affecting the prognosis. Finally to conclude early detection of underlying causes using various diagnostic aids along with prompt initiation of treatment will help in saving lives of patients with AKI.

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