IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 2 Ver. VII (Feb. 2015), PP 80-87
www.iosrjournals.org

Spectrum of Paediatric Acute Kidney Injury - A Referral Hospital Experience In A Developing Nation

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Abstract:
Context: *AKI in children is associated with significant morbidity and mortality in children.*
Aims: *To evaluate the etiological profile and factors predicting outcomes in paediatric acute kidney injury (AKI)*
Settings and Design: Prospective observational study from December 2012- November 2014
Methods and Material: *All children age 1day to 18 years of age with clinical symptoms or abnormal laboratory parameters suggesting acute kidney injury were included in the study. Demographic characteristics, clinical history and relevant investigations performed. Renal failure classified by pRIFLE. Renal biopsy was done if AKI was persisted >3weeks.Dialysis was performed when needed and outcomes are analysed.Statistical analysis used:Descriptive statistics for continuous variables. Pearson chi-square test for categorical data using Epi info [TM]7 statistical software.*
Results: *The incidence of AKI is 6.96%(122/1482).Neonates were 4.9%(6), infants were 12%(15),children 1-12years were53%(65) and 13-18years were29%(36). Male female ratio was 1.44(72/50). Infections were the commonest etiology in 57%(70) with highest being malaria. Glomerular diseases were seen in 30.3%(30) and were more common in 13-18years. Renal biopsy was done in 33.6%(41) and most common pathologies was acute tubular necrosis. About 48.36%(59) needed dialysis. The outcomes analysed are total recovery - 71.95%(89), progression to chronic kidney disease-10.65%(13) and death in 16.39%(20). Predictors of mortality include 1-12year age group (p value 0.03), infectious etiology(p value 0.001), respiratory distress (p value 0.003), abnormal liver enzymes (p value 0.02) and positive blood c/s (p value 0.009)*
Conclusions: *As AKI is common in children, frequent renal function testing is required for prevention in order to avoid long term outcomes.*
Keywords*: Acute kidney injury, paediatric age group,pRIFLE, outcomes, peritoneal dialysis*

I. Introduction

Acute kidney injury is a life threatening condition associated with significant morbidity and mortality in both children and adults(1). It has both short term(greater hospital stays, death) and long term consequences(residual renal abnormalities,progressionto chronic kidney disease)(2,3,4).Understanding the etiology, clinical profile and outcomes is important as it helps us to define protocols for early identification and implement strategies for prevention and treatment.

Variations in the reported incidence rates of acute kidney injury are due to varied definitions used to define acute kidney injury. Also geographical, cultural and economic variations determine the dissimilarity in the epidemiology of acute kidney injury in developed and developing countries(1).studies done on acute kidney injury in children are mostly retrospective in nature and report epidemiology of developed countries(5,6,7,8,9). Only few prospective studies have been done especially in developing countries where access to dialysis remains poor.

This is a prospective observational study conducted to evaluate epidemiology, clinical profile, need for renal replacement therapy and outcomes in children with acute kidney injury age group 1day to 18years.

II. Subjects and Methods

This is a prospective observational study conducted over a two year period from December 2012 to November 2014 in Andhra Medical College, Visakhapatnam, Andhra Pradesh, India. This Study was approved by institutional ethics committee and informed consent was taken from all parents. The objectives of the study are to determine the incidence, epidemiology, clinical profile of acute kidney injury, determine need for dialysis and analyse outcomes of acute kidney injury.

All children in the above said age group, who presented or developed clinical features or abnormal laboratory parameters suggestive of acute kidney injury, were included. These children were admitted either in NICU, PICU or Medicine ICU or wards In King George Hospital, Visakhapatnam who were referred to

Nephrology department in view of acute kidney injury. The clinical features include oedema, bladder mass, kidney mass, reduced urine output, passage of dark or blood stained urine and hypertension. The laboratory features include rise in serum creatinine, blood urea, metabolic acidosis, abnormal sodium, potassium, calcium homeostasis.

Those with a documented history of chronic kidney disease in past or at admission were excluded. Also all patients above 18 years of age were excluded. Standard management of acute kidney injury includes obtaining a relevant clinical history followed by a thorough clinical examination. Investigations ordered were complete blood picture, complete renal profile, complete urine examination, 24hr urine protein or spot P/C ratio in children making urine, serum electrolytes, liver function tests, lipid profile. Imaging tests included chest x ray PA view, electrocardiography, echocardiography, and ultrasound and obtaining special tests like CT scan and other investigations where necessary. Those patients in whom glomerular diseases were suspected, collagen profile, serum complement levels and other relevant investigations were done. Informed consent was taken from parents as all patients included are <18 years.

All patients were categorised based on eGFR criteria as described in RIFLE staging described for paediatric acute kidney injury by the Acute dialysis quality initiative program[6,7,12]. For those patients, with previous record a documented serum creatinine normal for his age was used to calculate eGFR. For those patients who did not have previous baseline serum creatinine, an eGFR of 100ml/min/1.73m2 was considered to be baseline. Schwartz formula was used to calculate eGFR and the percentage decrease in eGFR was used to classify RIFLE staging.

Blood and urine culture sensitivity tests were sent when infection was suspected. Malaria was diagnosed by either smear or QBC positive. Viral screening for HIV,HbsAg, Anti HCV were done in all children. We considered one admission as one episode of acute kidney injury.

Indications for renal replacement therapy included patients with one or more of the following

1. Anuria or oliguria with shortness of breath
2. Difficulty to control hypertension
3. Features of uremia like pericardial rub, altered sensorium, recurrent vomiting in the setting of rise in serum creatinine.
4. Intractable metabolic acidosis
5. Severe hyperkalemia

Peritoneal dialysis was the modality of RRT given to all patients as first dialysis and was the only modality given to children <30kgs. Hemodialysis was done to patients who were above >30kgs.

Patients who were not recovering within 3weeks or with active urine sediment or patients with unexplained renal failure underwent renal biopsy after taking consent from parents. Two cores of renal tissue were sent for Light microscopy and immunoflouresence. Based on highly suspected diagnosis, patients were treated until biopsy report. Based on specific histopathology, immunosuppression or other related changes in treatment were made. All patients were monitored throughout their hospital stay until death or recovery (complete or partial) at discharge. All patients were followed up for 3months in nephrology outpatient department to document recovery, progression to chronic kidney disease and death.

Statistical Analysis: Descriptive statistics was used to analyse continuous variables. Categorical data analysed by Pearson Chi-square Test. Epiinfo™ 7 statistics was used to analyse the data. P value less than 0.05 was taken as statistically significant.

III. Results

Out of 1482 paediatric(<18years) admissions during the study period, 122 children developed acute kidney injury as defined by pRIFLE, with an incidence of 6.96%.Out of the 122 patients, neonates(<1mon), were (6%), infants(1mon-1year) 15(12%), children aged 1-12years were 65(53%) and adolescents(13-18years) were 36 (29%). The mean age overall was 8.04±5.92years. Out of the 122, 71(59.1%) were male children and 50(40.9%) were female children. Almost in all age groups there was a preponderance of male children. The sex distribution in various age groups is shown in Table 1.

Classification of severity Acute kidney Injury:pRIFLE was used to classify severity of acute kidney injury. Ninety four (77.04%) patients were in Failure stage and 28(22.9%) patients had Injury stage. None of the patients were in risk stage.

Aetiology: Among the total 122 children, Infections led to acute kidney injury predominantly contributing to 57 %(70/122). This was followed by Glomerular diseases which caused acute kidney injury in 30.3% of children (37/122). Various infections causing acute kidney injury in the observed study are as follows are described in Table 2.

The incidence of glomerular diseases causing acute kidney injury in the total children contributed to 30.3%,and more in adolescents. The relative contribution by different diseases varied with age.Post infectious glomerulonephritis were more common in 1-12year age group contributing to 37.5% of the cases and Systemic lupus erythematosus more common in 12-18years. Steroid sensitive Nephrotic syndrome contributed to acute kidney injury in 29.17% in age group 1-12years and 38.46% in 13-18years. No cases of glomerular etiology causing acute kidney injury were reported in infants and neonates during the study period.Distribution of glomerular causes leading to acute kidney injury are as shown in Table 3.

Other causes:

Besides, infections and glomerulonephritis various other comorbidities lead to acute kidney injury in specific age groups.like congestive heart failure , hepatitis, diabetic ketoacidosis specifically in children 1-12years, renal tubular acidosis in infants, poisoning in adolescents and urinary retention secondary to posterior urethral valve obstructions in neonates. The relative frequency with which these diseases occurred are shown in Table 4.

Clinical profile of the patients:

The most common clinical feature was edema(67.2%) followed by oliguria(66.3%), fever(45.9%), shortness of breath(36.1%), and hematuria(24.6%).Central nervous system manifestations were seen in about 32(26.22%). Native medicine intake during the illness was seen in about 19 (15.6%) patients. Hypertension was seen in about 37(30.3%) patients and more common in adolescents16(44.4%). Hypotension seen in about 32(26.22%) patients and is more common in neonates 3(50%) and infants 5(33.3%)

Laboratory profile: Anemia was seen in 17(54.1%) patients, elevated total WBC count in 41(65.1%) patients, thrombocytopenia(<1,00,000 platelet count) in 26(21.3%) patients, hypoalbuminemia in 60(49.2%) patients, hyponatremia in 58(47.5%) patients, hypernatremia in 14(11.8%) patients, hypokalemia 18(14.7%) patients, hyperkalemia in 29(23.8%) and abnormal liver enzymes in 36(29.5%) patients. Sixteen (13%) patients had blood cuture positivity.

Renal biopsy

Renal biopsy was done in total 41 patients (33.60%).Of these, 23 patients (56.09%) were requiring dialysis. About 21(51.21 %) patients were aged between 1-12years and 20(48.78%) patients were between 13-18yrs of age. Common histopathological lesions noted were acute tubular necrosis in 8(19.51%), acute interstitial nephritis in 6(14.63%) and minimal change disease in 6(14.63%) patients. The other patterns noted were thrombotic microangiopahty in 3 (7.3%)children, SLE class 4 in 4(9.7%) patients, PIGN in 4(9.7%) patients, crescentric glomerulonephritis in 3(7.3%), FSGS in 2(4.87%), IgA nephropathy in 2(4.87%), C3 glomerulonephritis in 1(2.43%), and cortical necrosis in 2(4.87%).

Dialysis

Out of the 122, 59(48.36%) patients required dialysis. Hemodialysis was done in 23(39.98%) patients whose weight was above 30kgs. Total no of peritoneal dialysis sessions were 95.Average PD session per patient-1.55session. Total no. Of hemodialysis done were 23.Average HD sessions done per patient 0.68 session per patient. All the patients belonged to RIFLE stage F. Infections contributed to acute kidney injury in 39(66.1%) patients while glomerular diseases contributed to acute kidney injury in 13(22.03%) of patients in the dialysis group. About 23(38.98%) patients who were on dialysis underwent renal biopsy and most common pathology was acute tubular necrosis. Out of the 59 patients, 34(57.62%)recovered, 10(16.94%) progressed to chronic kidney disease and 15(25.42%) had died. Dialysis characteristics and outcomes are shown in Table 5.

Outcomes:

The outcome of the patients was noted as complete recovery, partial recovery and death at discharge. All alive patients were followed up for 3months period and noted for progression to chronic kidney disease or complete recovery. In our study 13 patients who had partial recovery at discharge progressed to chronic kidney disease at end of 3 months. The outcomes analysed at end of 3 months are recovery in 89(72.95%) of patients, chronic kidney disease in 13(10.65%) of patients and death in 20 (16.39%) of patients(Figure 1).

Predictors of mortality and chronic kidney disease: 1-12year age group, infections aetiology, shortness of breath, platelet count <100000, abnormal LFT and blood culture positivity were associated with mortality while glomerular aetiology, edema, hematuria and hypertension were associated with chronic kidney disease which was statistically significant.(Table 6)

IV. Discussion

This study describes acute kidney injury in a wide age group age <1day to 18yrs of age in a tertiary care centre in a developing country like India. In our study, the incidence of acute kidney injury is about 6.96%. The incidence of acute kidney injury in various studies reported ranges between 10-58 %[6,7,13,14,15]. A Study done by Krishnamurthy et al [16], in a tertiary care centre in South India also reported incidence of 5.2%.

In this study, 6% were neonates, 15% were infants, 53% were children between 1-13years and 29% were between 13-18years. Increasing age was associated with increasing incidence of acute kidney injury as described by Scott et al[18] in a study done in California where they described highest incidence of acute kidney injury in 15-18years age group. In present study there was a preponderance of male children. This finding is similar to that found in California study by Scott et.al(18) Male predominance is seen in acute kidney injury in adults [19] but only a few studies have descried similar observation in children[16, 17, 18].

Etiological profile of acute kidney injury is variable in developed and developing countries. Sepsis, glomerulonephritis, haemolytic uremic syndrome, acute tubular necrosis are more common in developing countries while haematological causes and respiratory distress causing acute kidney injury are more common in developed countries (9, 19).

In the present study, infections were the predominant aetiology causing acute kidney injury in about 57% of patients followed by glomerular diseases causing acute kidney injury in 30.3% of cases. The etiological profile is similar in 1-12year age group, but glomerular diseases leading to acute kidney injury were more common in 13-18year age group probably undermining hormonal influence in some glomerular diseases like SLE. This is similar to California study done by Scott et al[18] where they found a predominant glomerular etiology in 15-18year age group. Among infections, malaria contributed highest with 32.8% of infections, followed by post gastroenteritis acute kidney injury 14.3% and dengue & sepsis in 12.8% each.

Among glomerular diseases, steroid sensitive nephritic syndrome was common in both children (29.17%) and adolescents (38.46%). In children aged 1-12years, post infectious glomerular disease was the most common contributing to 37.5% followed by minimal change disease and haemolytic uremic syndrome. In age group 13-18years, systemic lupus erythematous was next to minimal change disease. No glomerular diseases leading to acute kidney injury were reported in infants and neonates in our study. Similar etiological profile was noted in study done in South India by Krishnamurthy et al(16) who also noted infections as most common etiology followed by PIGN in 1-12year age group. Also In Nigeria study done by Christofer et al (17), infections were the most common cause(25.7%) but incidence of malaria acute kidney injury seemed to be decreasing(12.5%).Infectious organisms lead to acute kidney injury by direct invasion leading to acute tubulointerstitial nephritis, hemodynamic instability, direct nephrotoxicity of tubules leading to acute tubular necrosis.

Most common clinical feature is oedema in 67.12% followed by oliguria in 66.3%, fever in 45.9% of patients, hypertension 30.3% of patients and hypotension in 26.3% of patients. Hypotension is more common in infants and neonates probably because of immaturity of tubules and impaired concentrating ability of the kidney at that age[20]. Hypertension was more common in adolescents probably because higher incidence of glomerular injury. This clinical profile is similar to that observed in Nigeria study (17) with fever, oliguria each occurring in 70% cases followed by oedema in 64.3%. Hypertension was noted in 50% of subjects in Nigeria study[17].

Most common laboratory feature observed in our study is elevated total WBC count in 65% followed by hypoalbuminemia in 49.2% of patients, hyponatremia 47.5%, hyperkalemia in 23.8%, thrombocytopenia in 21.3%, hypokalemia in 14.47% of patients. Similar to our study, Nigeria study done by Christopher et al(17) noted elevated total WBC count in 50% of patients and hyperkalaemia in 21.4% of patients, but hyperkalaemia and metabolic acidosis were more common (40-50%).

Renal biopsy was done in 33.60 % patients due to non recovering acute kidney injury, unexplained acute kidney injury or glomerular aetiology suspicion. Most common lesions observed were acute tubular necrosis 19.51%, acute interstitial nephritis in14.63% and minimal change disease in 14.03%. Other lesions seen were PIGN and SLE 9.7% each, TMA, crescentric glomerulonephritis 7.3% each, FSGS, IgA nephropathy and cortical necrosis and C3glomerulonephritis.data on renal biopsy of acute kidney injury in children is scarce as most studies report good recovery rates. A study done by Ali et al[21] in Pakistan demonstrated similar histological patterns in patients with renal insufficiency.

About 48.36% of patients needed dialysis. In the dialysis group, infections are the predominant aetiology contributing to 66.10% cases. About 38.98 % of dialysis patients were biopsied and most common pathological lesion was acute tubular necrosis. Fifty seven percent recovered, 16.94% progressed to chronic kidney disease and mortality was 25.42% in the dialysis group. The percent of patients who needed dialysis was about 31.4% in Nigeria study done by Christopher et al[17] and 14.5% In south India by Krishnamurthy et al[16]. Mortality reported in dialysis patients in various studies ranges from 20-33%[22,23,24,25].

Seventy two percent patients recovered, 11% progressed to chronic kidney disease and mortality was 16.39%. Predictors for mortality in our analysis were infectious-acute kidney injury, respiratory distress,

thrombocytopenia, abnormal liver function tests and blood C/S positivity. Infections-acute kidney injury contributed to 80% of deaths in acute kidney injury while glomerular acute kidney injury contributed to 15% of deaths. Predictors for chronic kidney disease in the current study include glomerular – acute kidney injury, edema, hematuria and hypertension. The mortality rates reported in various studies range from 16-43%. In the study done by Krishnamurthy et al[(16)] mortality reported 17.5% similar to our study. Also in that study, infectious contributed to highest mortality similar to our study, Partial recovery was seen in about 17.5% of patients. Sepsis and haemolytic uremic syndrome, along with dysnatremias and cental nervous system manifestations have been described as predictors of mortality in their study. Mortality was 15.3% in the California study done by Scott et al[(18)]and similar to our study infections were common cause.

This study is first study to follow up acute kidney injury in children for 3 months and report progression to chronic kidney disease. Limitations include referral bias as ours is a tertiary care centre and small sample size.

To conclude, acute kidney injury is not uncommon in children and is associated with morbidity and risk of chronic kidney disease. So careful management of acute kidney injury is required to prevent long term effects.

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Table 1 Sex Distribution In Various Age Groups

	N 122(%)	1-12 y(65)	13-18y(36)	Infants(21)	Neonates(6)
Males	72(59)	34(52%)	22(61%)	11(73%)	5(83.3%)
females	50(40)	31(47.6%)	14(38.8%)	4(26.6%)	1(16.6%)

Table 2 Infections Causing Acute Kidney Injury

Etiology	Overall (n=122)		1-12y (n=65)		13-18y (n=36)		<1y (n=15)		<1mon(n=6)	
Infections	70	57%	35	53.8%	19	52.8%	12	80%	4	66.7%
Sepsis in children	6	8.4%	4	11.42%	-	-	2	16.67%	-	-
Neonatal sepsis	3	4.2%	-	0%	-	-	-	-	3	75%
Puerperial sepsis	1	1.4%	-	0%	1	5.26%	-	-	-	-
Malaria	23	32.8%	10	28.57%	12	63.15%	1	8.34%	-	-
Dengue	9	12.8%	5	14.28%	2	10.52%	2	16.67%	-	-
Post GE	10	14.3%	5	14.28%	2	10.52%	3	25%	-	-
Pneumonia	9	12.8%	3	8.5%	2	10.52%	3	25%	1	25%
Disseminated tuberculosis	2	2.8%	2	5.7%	-	-	-	-	-	-
Meningoencephalitis	2	2.8%	2	5.7%	-	-	-	-	-	-
Hepatitis A	1	1.4%	1	2.8%	-	-	-	-	-	-
Leptospirosis	1	1.4%	1	2.8%	-	-	-	-	-	-
Scrub typhus	1	1.4%	1	2.8%	-	-	-	-	-	-
pyelonephritis	2	2.8%	1	2.8%	-	-	1	8.34%	-	-

Table 3 Glomerular Diseases Causing Acute Kidney Injury

etiology	Overall (n=122)		1-12y (n=65)		13-18y (n=36)		<1y (n=15)		<1mon (n=6)	
Glomerular diseases	37	30.3%	24	36.9%	13	36.2%	0		0	
SSNS	12	32.4%	7	29.17%	5	38.46%				
PIGN	9	24.3%	9	37.5%	-					
HUS	4	10.8%	3	12.5%	1	7.7%				
SLE	4	10.8%	1	4.17%	3	23.1%				
FSGS	2	5.4%	1	4.17%	1	7.7%				
ANCA	1	2.7%	1	4.17%	-					
C3GN	1	2.7%	1	4.17%	-					
ANTI GBM	1	2.7%	-		1	7.7%				
MN cresentic	1	2.7%	-		1	7.7%				
HSP	1	2.7%	1	4.17%	-					
Ig A nephropathy	1	2.7%	-		1	7.7%				

Table 4Etiology of Acute Kidney Injury

ETIOLOGY	Overall (n=122)		1-12y (n=65)		13-18y (n=36)		<1y (n=15)		<1mon (n=6)	
CHF	3	2.45%	2	3.1%			1	6.7%		
DKA	3	2.45%	3	4.6%						
Paraquat poisoning	1	0.8%			1	2.8%				
Supervasmol poisoning	1	0.8%			1	2.8%				
Snake bite	1	0.8%	1	1.53%						
PIH	1	0.8%			1	2.8%				
PUV- obstruction	2	1.63%							2	33.3%
RTA	2	1.63%					2	13.34%		
Sickle crisis	1	0.8%			1	2.8%				
Overall other causes	15	12.3%	6	9.2%	4	11.1%	3	20%	2	33.3%

Table 5ComparisionOf Patients Requiring Dialysis And Not Requiring Dialysis

	Dialysis		Non dialysis	
Total no of patients	59	48.36%	63	51.63%
Age group				
Neonates	3	5.08%	3	4.76%
Infants	5	8.47%	10	15.87%
1-12y	24	40.67%	41	65.07%
13-18y	25	45.76%	9	21.95%
Sex				
Males	30	50.84%	42	66.67%
Females	29	49.15%	21	33.33%
Etiology				
Infections	39	66.10%	31	49.20%
Glomerular diseases	13	22.03%	24	38.09%
Other causes	7	11.86%	8	12.69%

Renal biopsy done	23	38.98%	18	28.57%
Outcomes				
Recovery	34	57.62%	55	87.30%
Chronic kidney disease	10	16.94%	3	4.76%
Death	15	25.42	5	7.93%
Total survivors	44	74.57%	58	92.06%
Non survivors	15	25.42%	8	12.69%

Table 6 Predictors Of Outcome

	Recovery (N=89)		CKD (n=13)		Death(n=20)		P VALUE
Total no of patients	89	72.95%	13	10.65%	20	16.39%	
Age group							0.033
Neonates	4	4.49%	0	-	2	10%	
Infants	13	14.60%	0	-	2	10%	
1-12y	47	52.80%	5	38.46%	13	65%	
13-18y	25	28.08%	8	6.15%	3	15%	
Sex							0.162
Males	57	64.04%	7	53.84%	8	40%	
Females	32	35.95%	6	46.15%	12	60%	
Etiology							0.001
Infections	52	58.42%	2	15.38%	16	80%	
Glomerular diseases	24	26.96%	10	76.92%	3	15%	
Other causes	13	14.60%	1	7.69%	1	5%	
Renal biopsy done	21	23.59%	13	100%	7	35%	
Dialysis done	34	38.20%	10	76.92%	15	75%	0.14
Clinical profile	Recovery (N=89)		CKD (n=13)		Death(n=20)		
Fever	32	35.95%	8	61.53%	16	80%	0.28
Oliguria	59	66.29%	10	76.92%	12	60%	0.603
Hematuria	17	19.10%	13	61.53%	5	25%	0.002
Shortness of breath	27	30.33%	4	30.76%	13	65%	0.003
Edema	54	60.67%	13	100%	15	75%	0.006
Bleeding	5	5.6%	0	0	6	30%	
Jaundice	9	10.11%	0	0	5	25%	0.06
CNS manifestations	24	29.21%	2	15.38%	6	30%	0.38
Diarrhoea	11	12.35%	1	7.69%	3	15%	
Native medicine intake	12	13.48%	2	15.38%	5	25%	0.439
	Recovery (N=89)		CKD (n=13)		Death(n=20)		
Normotension	42	47.14%	5	38.46%	6	30%	0.03
Hypotension	24	26.96%	0	-	8	40%	
hypertension	23	25.84%	8	61.53%	6	30%	
Lab profile	Recovery (N=89)		CKD (n=13)		Death(n=20)		
Hb<7	7	7.86%	2	15.38%	8	40%	0.24
Hb>7	82	92.13%	11	84.61%	12	60%	
TWBC <11000	30	33.7%	3	23.07%	8	40%	0.59
TWBC >11000	59	66.29%	10	76.92%	12	60%	
Platelet count							0.003
<100000	14	15.73%	2	15.38%	10	50%	
>100000	75	84.26%	11	84.61%	10	50%	
Serum albumin							0.22
<3	40	44.94%	9	69.23%	11	55%	
>3	49	55.05%	4	30.76%	9	45%	
Serum calcium							
<8	47	52.80%	6	46.15%	14	70%	0.43
>8	42	47.19%	7	53.84%	6	30%	
Serum sodium							
<135	42	47.19%	6	46.15%	10	50%	0.39
135-145	34	38.20%	7	53.84%	10	45%	
>145	13	14.60%	0	-	1	5%	
Serum potassium							
<3.5							0.71
3.5-5.5	16	17.97%	1	7.69%	1	5%	
>5.5	56	62.92%	7	53.84%	12	60%	
	17	19.10%	5	38.46%	7	35%	
LFT abnormal	22	24.71%	2	15.38%	12	60%	0.024
Blood c/s ++	7	7.86%	1	7.69%	8	40%	0.009

Figure 1 Outcomes Of Acute Kidney Injury