

A study of etiology, clinical profile and prognosis in patients with acute kidney injury

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Abstract

Background: Acute renal failure (ARF) refers to an abrupt and sustained decrease in renal function resulting in retention of nitrogenous (urea and creatinine) and non-nitrogenous waste products. AKI is common, harmful, treatable and largely preventable but there are very few studies available on this subject from India using various serum creatinine values.¹ Hence we carried out this study to look into the varied etiology of AKI and their outcome using newer AKI definitions. **Aim:** To determine the cause, prognosis and outcome in patients of Acute Kidney Injury (AKI) admitted in a tertiary care hospital. **Materials and Methods:** A Hospital based Prospective study was conducted in Department of Medicine, Santhiram medical college and general hospital for a 1 year period. Universal Sampling Technique was used for selection of study subjects. All the patients coming to medicine department during the study period with age >18 years and Patients who fulfill AKIN criteria were taken for study after taking prior informed consent. Final sample size was 69 subjects of Acute Kidney Injury of varied etiology. **Results:** Mean of study subjects was 48.9 years (range from 19-87 years) with M: F ratio of 4.75:1. Most common etiology for AKI was Sepsis (14.5%) and Malaria infection (14.5%) followed by Dengue, AGI and Leptospirosis (11.6% each). Multi organ dysfunction (14.5%) was observed in patients of Sepsis and Lepto. Out of total patients, 46 (66.7% %) had stage II AKI, while 23 (33.3 %) had stage III AKI according to AKIN staging. A total of 11.6% patients were on dialysis. Two out of 23 patients of AKI stage III (8.7%) and one patient out of 46 (2.2%) belonging to AKI stage II died during the study. **Conclusion:** AKI was observed at a relatively younger age in present study with male preponderance. Most common etiologies were Sepsis and Malaria. Most of the patient of Sepsis, MODS and Leptospirosis were having stage III AKI. Overall mortality observed was 4.34

Key Word: acute kidney injury.

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INTRODUCTION

Acute renal failure (ARF) is a generic term for an abrupt and sustained decrease in renal function resulting in retention of nitrogenous (urea and creatinine) and non-nitrogenous waste products.² Depending on the severity

and duration of the renal dysfunction, this accumulation is accomplished by metabolic disturbances, such as metabolic acidosis and hyperkalemia, changes in body fluid balance, and effects on many other organ systems. Recent evidence has shown that relatively small changes in renal function are associated with substantial increases in mortality.³ For this reason, the term ARF was replaced by that of Acute Kidney Injury (AKI) which encompass the entire spectrum of the syndrome from minor changes in markers of renal function to requirement for Renal Replacement Therapy (RRT).⁴ In May 2004, a new classification, the RIFLE (Risk, Injury, Failure, Loss of kidney function and End stage kidney disease) classification, was proposed by the Acute Dialysis and Quality Initiative Group (ADQI) in order to define and stratify the severity of AKI.⁵ Three years later in March 2007, the Acute Kidney Injury Network (AKIN)

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classification, a modified version of the RIFLE was released in order to increase the sensitivity and specificity of AKI diagnosis. AKI has been reported among 2-7% of hospitalised patients.⁶ Hospital acquired acute kidney injury is at least 5-10 times more common than community acquired AKI.⁷ These rates are increasing not only due to aggressive treatment of an ageing population but also the impact of newer nephrotoxic medications and diagnostic procedures.⁸ The most common drugs associated with renal toxicity in elderly individuals are NSAIDs and nephrotoxic antibiotics such as aminoglycosides.⁹ Although patients with AKI did not die directly as a result of their renal failure, renal failure was an independent risk factor for death. The burden of AKI is most significant in developing countries with limited resources for the care of these patients once the disease progresses to kidney failure necessitating RRT.¹⁰

AIM AND OBJECTIVES

To determine the cause, prognosis and outcome in patients of Acute Kidney Injury (AKI) admitted in a tertiary care hospital.

MATERIAL AND METHODS

A Hospital based Prospective study was conducted in Department of General Medicine, Santhiram Medical College and General Hospital for a 1 year period after taking approval from Hospital Ethics and Research Committee.

Sampling Technique and Sample Size: Universal Sampling Technique was used for selection of study subjects. All the patients coming to medicine department during the study period and fulfilling the inclusion criteria were taken for study after taking prior informed consent. The patients included in the study were from both ICU and wards. Final sample size came to be 69 subjects of Acute Kidney Injury of varied etiology.

Inclusion Criteria

1. Age >18 years
2. Patients who fulfill AKIN Criteria

Exclusion criteria

1. Age <18 years
2. Established End Stage Renal disease and on hemodialysis
3. Death within 1 day of admission
4. Patients already on hemodialysis

Data Analysis: Association between qualitative variables was done with the help of Chi square test. P value <0.05 was taken as significant. Quantitative data was represented using mean±SD and median and IQR (Interquartile range).

RESULTS

Over half of the subjects were above 50 years of age with average of study subjects was 48.9 years (range from 19-87 years). There were 8 (11.6 %) patients with age >70 yrs. 82.6% of the study subjects males and 17.4% females with M:F ratio of 4.75:1. The mean age of study subjects was 48.9 years while mean Hb level was 13.1 gm%. Mean calcium, Sodium and potassium level was 9.1, 133.8 and 4.1gm%.

Table 1: Distribution based on Age and Investigation findings

Variables	Mean	SD	Minimum
Age (years)	48.9	17.0	19.0
Hb gm%)	13.1	1.0	10.6
TC	15542.0	19036.0	2900.0
S. Calcium	9.1	0.3	8.8
Platelets	190540.6	124910.4	3500.0
S.Sodium	133.8	4.1	121.0
S. Potassium	4.1	0.6	2.7

Mean Blood urea level on admission was 107.8 mg%, at discharge it was 51.6 mg% and at 3 month follow up it was 36.26 gm% (68% had S. urea < 40 mg%). The difference at admission, discharge and 3 month follow up was statistically significant (p< 0.05). Mean Serum Creatinine level on admission was 4.03 mg%, at discharge it was 3.26 mg% and at 3 month follow up it was 1.2 gm% (56% patients had S. Creat. <1.2 mg%). The difference at admission, discharge and 3 month follow up was statistically significant (p< 0.05). At admission, the mean input volume was 1525 ml/day and output volume was 890.74 ml/day. At discharge, the mean input volume was 1799.42 ml/day and output volume was 1676.81 ml/day. There is significant improvement at discharge from their admission values (p< 0.05). Urine Albumin was present in 56.5% patients while pus cells and RBC was present in 20.3% and 13% patients. Abnormal LFT was observed in 23.2% patients of Acute Kidney Injury. On USG, normal kidneys was observed in over half of the patients while grade I and II RPC was observed in 30.4% and 4.3% patients. Other findings included Cystitis(4.3%), Pyelonephritis(4.3%), Prostatomegaly(2.9%) and obstructive uropathy (1.4%). Malaria was found positive in 14.5% of the patients while Leptospirosis and Dengue in 11.6% patients each. Blood culture for Staphylococcus, pseudomonas and E.coli was found positive in 10.1%, 1.4% and 1.4 % patients respectively. ARDS was observed in 10.1% while pulmonary oedema in 4.3% patients. Abnormal echo findings were observed in 5.8% patients. Most common diagnosis for AKI was Sepsis (14.5%) and Malaria infection (14.5%) followed by Dengue, Acute gastroenteritis and Leptospirosis (11.6% each). Multi organ dysfunction (14.5%) was observed in patients of Sepsis and Leptospirosis Out of total patients, 46 (66.7%)

had stage II AKI, while 23 (33.3%) had stage III AKI according to AKIN staging.

Table 2: Distribution based on AKIN Staging

AKIN Stage	N	%
I	0	0.0%
II	46	66.7%
III	23	33.3%
Total	69	100.0%

A total of 8 (11.6%) patients were on dialysis while 88.4% were not on dialysis. A total of 3 patients died during the study, all of which were cases of Sepsis. Two out of 23 patients of AKI stage III (8.7%) and one patient out of 46 (2.2%) belonging to AKI stage II died in the study. All the patients with AKI stage III were on Dialysis.

Table 3: Outcome based on AKIN grading

AKIN Stage	Outcome		Total
	Death	Recovered	
II	2.20%	97.80%	100.00%
III	8.70%	91.30%	100.00%
Total	4.30%	95.70%	100.00%

p- value 0.21

Table 4: Distribution of diagnosis based on AKIN grading

Diagnosis	No. Of patients		Total
	AKIN stage 2	AKIN stage 3	
CCF	4	0	4
Cellulitis	5	0	5
Cystitis	3	1	4
Dengue fever	7	1	8
Diabetic ketoacidosis	1	0	1
Enteric fever	1	0	1
Gastroenteritis	6	2	8
Leptospirosis	1	7	8
Malaria	9	1	10
NSAID induced AKI	2	0	2
Obstructive uropathy	1	1	2
Pyelonephritis	1	2	3
Sepsis	2	8	10
UTI	3	0	3
Total	46	23	69

Most of the patient of Sepsis and Leptospirosis (80% and 87.5%) were having stage III AKI, while all patients of MODS were having Stage III AKI.

DISCUSSION

It is recognized that the epidemiology of AKI in developing countries differs from that of the developed world in many important ways. Whereas in developed regions elderly patients predominate, in developing countries, AKI is a disease of the young and children, in whom volume-responsive “prerenal” mechanisms are common. Although overall mortality seems to be lower than in developed countries, this finding is not true across all age groups: In these regions, AKI affects

predominantly the young and children and mortality is high.¹¹ In a study by Ravindra *et al.*¹² sepsis as a cause of AKI was observed in 28%, Leptospirosis is the most important zoonosis in the world. Patients are typically young men. Several factors are involved in acute kidney injury (AKI) in leptospirosis, including direct nephrotoxic action of the leptospira, hyperbilirubinemia, rhabdomyolysis and hypovolemia. In developed countries, leptospirosis is an uncommon cause of acute kidney injury (AKI). However, in tropical countries, where the disease is endemic, leptospirosis is an important cause of AKI. The incidence of AKI varies from 10% to 60%. In a recent study, 58 patients with leptospirosis and AKI had hemorrhagic diathesis (80%), liver failure (72%), respiratory failure (38%), circulatory failure (33%), pancreatitis (25%), and rhabdomyolysis (5%). Arterial hypotension is common. The hemodynamic status and alterations in most patients with severe leptospirosis are similar to those observed in patients with sepsis. Because of systemic vasodilation, the plasma levels of aldosterone and antidiuretic hormone are high. Renal vasoconstriction and decrease in diuresis occur. Neveu *et al.*¹³ performed a prospective study involving 345 patients who had acute renal failure with or without sepsis. The most dramatic differences were the increased requirement for mechanical ventilation (70 percent vs. 47 percent, P=0.001) and the higher mortality (74.5 percent vs. 45.2 percent, P<0.001) in the patients with sepsis.(18-80). In present study out of total patients, 46 (66.7% %) had stage II AKI, while 23 (33.3 %) had stage III AKI according to AKIN staging. No age and gender difference was observed in the distribution of patients according to AKI stage. Two out of 23 patients of AKI stage III (8.7%) and a single patient out of 46 (2.2%) belonging to AKI stage II died in the study.

CONCLUSION

The following conclusions were derived from this study

1. AKI was observed at a relatively younger age in present study
2. Male preponderance
3. Most common etiologies were Sepsis and Malaria.
4. Most of the patients with Sepsis, MODS and Leptospirosis had stage III AKI
5. Overall mortality observed was 4.34%.

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