



## PROSPECTIVE STUDY OF ETIOLOGY, CLINICAL PROFILE AND OUTCOME OF ACUTE KIDNEY INJURY IN TERTIARY CARE HOSPITAL, KING GEORGE HOSPITAL, VISAKHAPATNAM, AP, INDIA.

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### KEYWORDS :

#### INTRODUCTION

Acute kidney injury is a common clinical syndrome characterized by an abrupt decline of renal function and has been recognized as a major health care problem affecting millions of patient's worldwide. Acute kidney injury (AKI) is a heterogeneous syndrome defined by rapid (hours to days) decline in the glomerular filtration rate (GFR) resulting in the retention of metabolic waste products, including urea and creatinine, and dysregulation of fluid, electrolyte, and acid-base homeostasis. The term acute kidney dysfunction might better characterize the entire spectrum of the syndrome. However, acute kidney injury is the term that has been increasingly utilized in the medical literature. Acute kidney injury can develop de novo in the setting of intact kidney function or can be superimposed on underlying chronic kidney disease. In fact, the presence of underlying impaired kidney function has been shown to be one of the most important risk factors for the development of AKI. The etiology and outcomes of AKI are mainly influenced by the circumstances in which it occurs, such as, whether it develops in the community or in the hospital. It is important to distinguish whether the kidney injury occurs as an isolated process that is more common in community acquired AKI, or it occurs as part of a more extensive multi organ syndrome. In 2004, Acute Dialysis Quality Initiative (ADQI) group, International Society of Nephrology (ISN), National Kidney Foundation (NKF) and American - 2 - Society of Nephrology (ASN) met and proposed the term Acute Kidney Injury. AKI generally defined as: an abrupt and sustained decrease in kidney function' In 2004, Acute Kidney Injury Network (AKIN) was formed. AKIN proposed a diagnostic criteria for the definition AKI. An abrupt (within 48 hours) reduction in kidney function currently defined as an absolute increase in serum creatinine of more than or equal to 0.3 mg/dl ( $\geq 26.4 \mu\text{mol/l}$ ), a percentage increase in serum creatinine of more than or equal to 50% (1.5-fold from baseline), or a reduction in urine output (documented oliguria of less than 0.5 ml/kg per hour for more than six hours). Decreased urine output is a cardinal manifestation of AKI, and patients are often classified based on urine flow rates as non oliguric (urine output  $>400$  mL/day), oliguric (urine output  $<400$  mL/day), or anuric (urine output  $<100$  mL/day). Data emerged recently suggesting small increases in Serum Creatinine may be associated with adverse outcomes than those considered in RIFLE criteria. So AKIN proposed a new classification/staging system. oliguric AKI is associated with higher mortality risk than non oliguric AKI, therapeutic interventions to augment urine output have not been shown to improve patient outcomes.

#### AIM OF THE STUDY -

Prospective Study Of Etiology , Clinical Profile And Outcome Of Acute Kidney Injury In Tertiary Care Hospital.

#### MATERIALS AND METHODS

- 1) **STUDY DESIGN** :Hospital based Prospective observational study
- 2) **STUDY POPULATION** : 50 Subjects
- 3) **PLACE OF STUDY** : King George hospital, Visakhapatnam.
- 4) **PERIOD OF STUDY** : January 2018 - September 2019.

**INCLUSION CRITERIA** : The patients with an absolute increase in serum creatinine of more than or equal to 0.3mg/dl ( $>$  or = 26.4micromoll/ml), a percentage increase in serum creatinine of more than or equal to 50%(1.5 fold from baseline).

#### EXCLUSION CRITERIA :

- 1) Patients with chronic kidney disease.

- 2) Patients with abnormal kidney size and abnormal cortico-medullary differentiation.

#### METHODOLOGY

A thorough diagnostic evaluation of 50 patients will be done by a detailed history, physical examination, complete urine examination, renal function tests, renal ultrasound, smear for malaria, serology for enteric fever, leptospirosis and other relevant investigations are performed to find the cause of acute kidney injury. After the diagnosis is made, appropriate treatment is given, etiological factors are treated if possible and offending agents are withdrawn. Prognosis and outcome of the patients are studied and if required renal replacement therapy is done.

#### OBSERVATIONS & DATA ANALYSIS

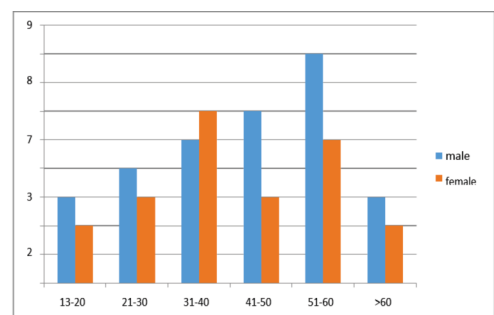
Total Number of Patients	-	50
Male	-	29
Female	-	21
Age group range	-	13-75 yrs
Mean age	-	42.45

The most common clinical features observed in our study were oliguria (86%), vomiting(82%), fever(66%), pedal oedema (32%), altered sensorium (12%), jaundice(26%).

**Table 1 Distribution By Age And Sex**

Age(yrs)	Male	Female	Total (n=50)
13-20	3	2	5
21-30	4	3	7
31-40	5	6	11
41-50	6	3	9
51-60	8	5	13
>60	3	2	5
	29	21	50

**Figure 1**



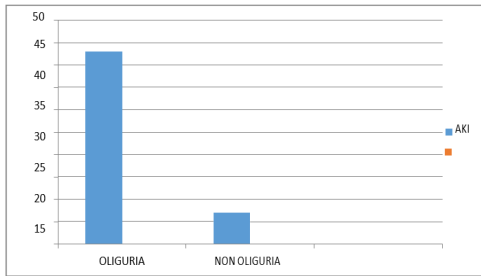
**Age And Sex Distribution Of Acute Kidney Injury Distribution By Age And Sex**

The study group included 50 patients with a mean age of 42.45 years with a minimum age 13 of years and the maximum being 75 years. Out of 50 patients, 29 were males and 21 were females. Among 50 patients, 5 patients were in the age group of 13-29 years , 7 were in 21-30 age group , 11 were in 31-40 years age group , 9 were in 41-50 age group , 13 were in 51-60 age group and 5 were in age group 61-75.

**Table 2 Presenting Features Of Aki In Our Study**

URINE OUTPUT	MALE	FEMALE	Total(n=50)
OLIGURIA	25	18	43
NON OLIGURIA	4	3	7
Total	29	21	50

**Figure 2**

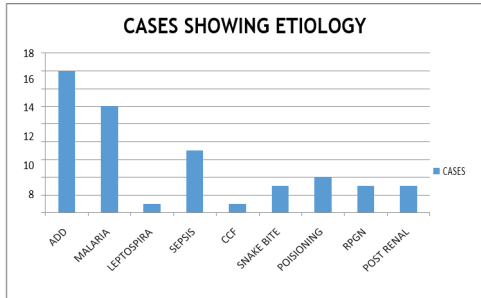


The most common presenting feature of AKI in our study is oliguria. It accounted for about 86% i.e., 43 patients. Only 7(14%) out of 50 patients had non oliguric AKI.

**Table – 3 Etiological Profile Of Aki In Our Study**

ETIOLOGY	MALE	FEMALE	(N=50)	P VALUE
ADD	9	7	16	0.86
MALARIA	7	5	12	0.97
LEPTOSPIRA	1	0	1	Fischer 0.58
SEPSIS	4	3	7	0.96
CCF	1	0	1	Fisher 0.58
SNAKE BITE	2	1	3	0.75
POISONING	2	2	4	0.73
RPGN	1	2	3	0.37
POST RENAL	2	1	3	0.75

**Figure 3**

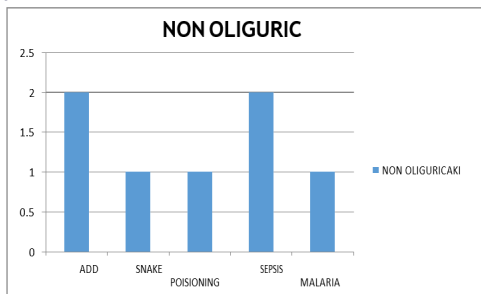


In our study, maximum cases of AKI were due to acute diarrhoeal diseases 16(32%) followed by malaria 12(24%) and infections leading to sepsis 7(14%). 2 patients(4%) developed AKI followed by snake bite and 2 patients(4%) had AKI after poisoning. 1 case(2% each) of Leptospirosis and CCF are the remaining causes of AKI.

**Table 4 Etiology Of Non Oliguric AKI**

NON OLIGURIC AKI IN OUR STUDY	No of cases
ADD	2
SNAKE BITE	1
POISONING	1
SEPSIS	2
MALARIA	1
TOTAL	7

**Figure 4**

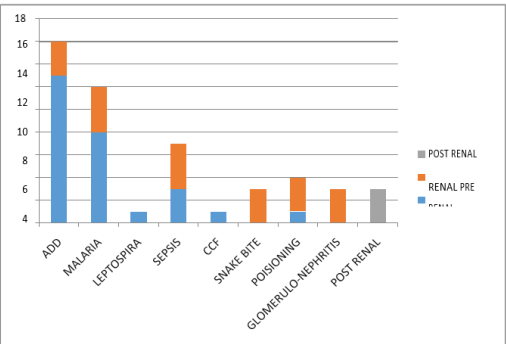


In our study, 7 persons(14%) developed non oliguric AKI. Out of these 7 cases, 2 cases each of ADD and sepsis had non oliguric AKI. 1 each of snake bite, poisoning and malaria developed non oliguric AKI. All the cases recovered.

**Table 5 Etiology Of AKI In Our Study**

Etiology	No Of Cases	Pre Renal	Renal	Post Renal	P Value
ADD	16	13	3	0	0.02
Malaria	12	8	4	0	0.57
Leptosira	1	1	0	0	0.99
SEPSIS	7	3	4	0	0.64
CCF	1	1	0	0	0.99
Snakebite	3	0	3	0	0.148
Poisoning	4	1	3	0	0.45
Glomerulonephritis	3	0	3	0	0.148
Post Renal	3	0	0	3	0

**Figure 5**

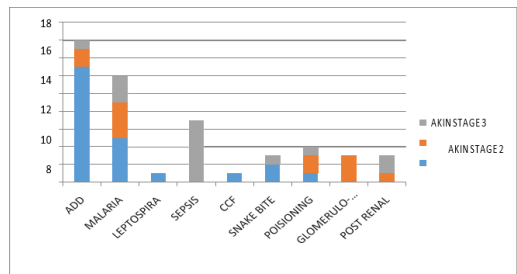


In our study, pre renal AKI is the most common cause. ADD and malaria are the common causes of pre renal AKI. Sepsis, snake bite, poisoning and glomerulonephritis account for intrinsic renal AKI i.e. 20 cases(40%) and the remaining 3 cases(6%) are due to post renal AKI (BPH, calculi).

**Table 6 Classification Based On Akin Criteria**

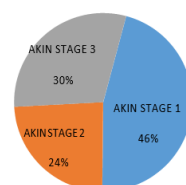
Etiology	No Of Cases	AKIN Stage 1	AKIN Stage 2	AKIN Stage 3	P Value
Add	16	13	2	1	0.0023
Malaria	12	5	4	3	0.68
Leptosira	1	1	0	0	0.99
Sepsis	7	0	0	7	0
CCF	1	1	0	0	0.99
Snake Bite	3	2	0	1	0.788
Poisoning	4	1	2	1	0.432
Glomerulone Phritis	3	0	3	0	0.0112
Post Renal	3	0	1	2	0.149

**Figure 6**



**Figure 7**

**AKI AKIN CRITERIA**

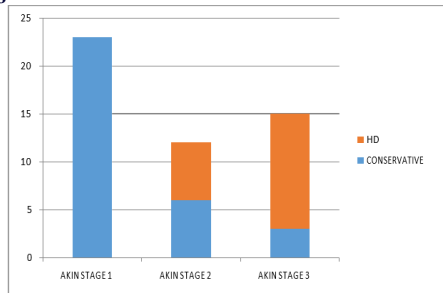


In our study based on AKIN criteria, 23 patients (46%) were included in AKIN stage 1, 12 cases (24%) were in AKIN stage 2, 15 cases (30%) in AKIN stage 3. in AKIN stage 1, all patients were treated conservatively and all patients recovered well. In AKIN stage 2, out of 12 patients, 6 patients (50%) were treated conservatively and 6 patients (50%) were dialysed and 2 patients expired. In AKIN stage 3, out of 15 patients (30%), 3 were treated conservatively and 12 patients were dialysed and 5 patients died due to complications.

**Table 7 Acute Kidney Injury - Treatment**

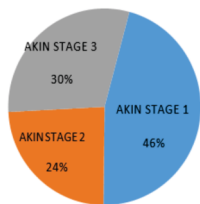
AKIN STAGE	NO OF CASES	CONSERVATIVE	HD
AKIN STAGE 1	23	23	0
AKIN STAGE 2	12	6	6
AKIN STAGE 3	15	3	12

**Figure 8**



**Figure 9**

**AKI AKIN CRITERIA**

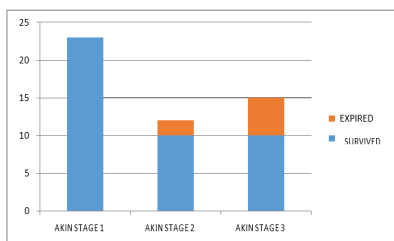


In AKIN stage 1, all the 23 cases were treated conservatively and all the cases recovered. In AKIN stage 2, out of 12 patients, 6(50%) patients were treated conservatively and 6(50%) patients underwent hemodialysis. 2 patients expired and 4 patients recovered. In AKIN stage 3, out of 15 patients, 3 patients were conservatively treated and 12 were dialysed. 5 patients died due to complications and 7 patients survived.

**Table 8 Acute Kidney Injury-Outcome**

AKIN STAGE	NO OF CASES	SURVIVED	EXPIRED
AKIN STAGE 1	23	23	0
AKIN STAGE 2	12	10	2
AKIN STAGE 3	15	10	5

**Figure 10**



In our study, 18 patients have undergone dialysis and 11(61.11%) patients recovered well. 7(38.88%) patients expired. In AKIN stage 1 all patients recovered without any mortality. In AKIN stage 2, out of 12 patients, 10 patients survived and 2(16.88%) patients expired. In AKIN stage 3, out of 15 patients, 10 patients survived and 5(33.33%) patients expired.

**Table 9 Comparison Of Mean Age**

Name Of Study	Males %	Females %	Mean Age
Benrich B et al	58	36	56.2
Ravindra L Mehtha et al	59	41	59.5

Study	Males %	Females %	Mean Age
Ananth PV et al	57	43	-
Present study	58	42	42.45

**Table 10 Comparison Of Incidence Of AKI**

Name Of Study	Country	No Of Patients	Incidence Of AKI
Fang et al	china	1,76,155	3.19%%
Lu et al	china	38,734	2.41%
wang et al	USA	19,249	22.70%
zeng X et al	USA	25,859	16.60%

**Table 11 Comparison Of Symptoms And Signs In Our Study With The Previous Studies**

symptoms and signs	present study	Bernieh et al	singhal AS et al	liano F et al
vomitings	82%	85.20%	80%	86%
oliguria	86%	80%	78%	80%
fever	66%	68%		
hypotension	24%	20.60%	52%	32.80%
odema	32%		20%	
jaundice	26%	20%		

**Table 12 Comparison Of AKI Based On Type Of AKI**

Name of the study	Pre renal	Intrinsic renal	Post renal
Liano F et al	20%		
Fang et al	52%	44.7%	3.3%
Hakim et al			9%
present study	54%	40%	6%

**TABLE 13 Comparison Of Etiology Of AKI With Other Studies**

Etiology	present study	ananth PV et al	cenzig utas et al	Muthu sethupathi et al	pedro chimezie Ememchioma et al
ADD	32%	44%	48%	30.50%	14.51%
Malaria	24%	8%	5.40%	0%	17.74%
Sepsis	14%	10%	16%	6.20%	32.25%
Snake bite	6%	5%	20%	4.70%	24.19%
Poisoning	8%	8%	8%	3.40%	11.29%
Glomerulo-nephritis	6%	5%		8.50%	
Leptospirosis	2%		2.66%	31%	0%
CCF	2%				
Post renal	6%	2%			

**Table- 14 Comparison Of AKI patients by AKIN criteria in different studies**

Study	AKIN stage 1	AKIN stage 2	AKIN stage 3
present study	23(46%)	12(24%)	15(30%)
bosan et al	31.30%	10.60%	58.10%

**Table 15 Comparison Of Mortality In AKI Patients**

Author	AKI definition used	Mortality end point	mortality
thakar et al <sup>59</sup>	RIFLE	ICU	10.90%
ostermann an chang <sup>60</sup>	RIFLE	ICU	10%
gammelager et al <sup>61</sup>	RIFLE	30 days	40.00%
joannidis et al <sup>62</sup>	RIFLE	hospital	36.40%
mandelbaum et al <sup>63</sup>	AKIN	hospital	9.10%
hoser et al <sup>64</sup>	RIFLE	hospital	13.30%
cruz et al <sup>65</sup>	RIFLE	ICU	36.30%
present study	AKIN	hospital	14%

**Table 16 Comparison Of Management Of AKI With Other Studies**

Name of study	Conservative	Hemodialysis
khan et al	74%	13(26.00%)
hakim et al	74%	26.00%
bernieh et al	58%	42.00%
present study	64%	36%

**Table 17 Comparison Of Outcome Of AKI**

present study	Name of study	Patients underwent hemodialysis	Recovered	Expired
	khan et al	13	69.30%	30.70%

**Table 18 Mortality Of AKI In Different Studies**

Name of study	No of patients	Population studied	Type of study	Criteria used	Time of end point	Mortality
hoste et al <sup>66</sup>	5283	ICU	retrospective	cr, uo	in hospital	R-8.8% I-11.4% F-26.3%
uchino et al <sup>67</sup>	20126	ICU	retrospective	cr,GFR	30 days	R-15.1%, I-29.2%, F-41.1%
cruz et al <sup>65</sup>	2164	ICU	prospective	cr,uo	60 days	R-20%, I-29.3%, F-49.5%
ali et al <sup>68</sup> osterman	5321	populatio n based	retrospective	cr,GFR	6 months	R-46%, I-48%, F-56% R-20.9%,
and chang et al <sup>69</sup>	41972	ICU	retrospective	cr,GFR	in hospital	I-45.6%, F-56%
bagshaw et al <sup>70</sup>	120123	ICU	retrospective	cr, uo	in hospital	R-17.95, I-27.7%, F-33.2% AKIN I-0%,
PRESENT STUDY	50	hospital and ICU		cr, uo	in hospital	AKIN 2-16.88%, AKIN 3-33.33%

**SUMMARY**

In our study, males outnumbered females. Most commonly involved age group is between 51-60. The most common clinical presentation is fever, oliguria, jaundice, hypotension, dyspnoea. The most common etiology in our study is ADD followed by malaria. As the study is done in a developing country, the most common cause is infections followed by snake bite and poisoning. The patients are categorized based on AKIN criteria. They are classified into 3 stages. All the patients in AKIN stage 1 recovered with conservative management. In AKIN stage 2, 50 % patients underwent dialysis, and 50% patients recovered with conservative management. In AKIN stage 3, 80% patients were dialysed and 20% patients recovered conservatively. In AKIN stage 2, 2 patients expired and in AKIN stage 3, 5 patients expired.

**CONCLUSION**

The presentation of AKI is predominantly oliguric, but non oliguric AKI should be borne in mind. Acute diarrheal disease still remains the most common cause of acute kidney injury. Mortality observed during the study is very low when compared the previous studies. Awareness of early re hydration therapy and early referral to higher centers contribute to decline in mortality. Infections occupies significant place in the etiology of AKI, which includes malaria (including complicated), Leptospirosis, enteric fever, and combination of above infections. Regarding sepsis we have to prevent the multi organ failure or we have to treat the multi organ failure very aggressively to reduce the higher mortality associated with sepsis. Majority of our patients were managed conservatively. When dialysis is indicated for clinical or biochemical reasons, HD is the preferred mode of dialytic support. PD is begin only when HD is not available or it is contraindicated. Main issues obtained were about two-third of patients with AKI can be managed by conservative measures alone and about one-third of patients need dialysis. Delayed diagnosis and treatment, pulmonary and other infections, the frequent presence of complicating features and the multi organ dysfunction syndrome are the chief reasons for the mortality rate in our study. The frequency of peritoneal dialysis is decreased so drastically because of availability of hemodialysis and higher efficiency of hemodialysis. The RIFLE classification was suitable for the definition of acute kidney injury in all type of medical settings. There was an association between acute kidney injury and hospital outcome, but associated organ failure, had a greater impact on prognosis than severity of acute kidney injury.

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