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Study on Etiology, Clinical Characteristics and Prognosis in Individuals with Acute Renal Injury

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Abstract
Background: When renal function suddenly and persistently declines, urea and creatinine are retained along with other metabolic byproducts; this condition is known as acute renal failure (ARF). The purpose of this study is to examine the demographics, etiology, and treatment outcomes of Acute Kidney Injury (AKI) patients admitted to a tertiary care facility.
Material and Methods: It was a prospective study carried out at Department of General Medicine, SVS Medical College, Yenugonda, Mahabub Nagar, Telangana, India. In this study, participants were chosen using a method called the Universal Sampling Technique. Those who met the inclusion criteria and presented to the medicine department throughout the study period were enrolled in the trial after obtaining their informed consent.
Results: The average age of the participants was 48.9 (range: 19–87) and the male to female ratio was 4.75 to 1. Sepsis and malaria infection (14.5%) were the leading causes of AKI, followed by acute gastroenteritis and leptospirosis. Patients with sepsis and septic shock also showed signs of multi-organ failure (14.5%). In terms of AKIN stage, 40 patients were classified as having stage II AKI.
Conclusion: In the current study, AKI was diagnosed at a younger age, and it was more common in men. Sepsis and malaria were the leading causes of death. Patients with Sepsis, MODS, and Leptospirosis tended to be in stage III AKI. The overall death rate was 4.34 percent.
Keywords: Etiology, clinical profile, and prognosis, acute kidney injury

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Introduction

Retention of both nitrogenous (urea and creatinine) and non-nitrogenous waste products is a hallmark of acute renal failure (ARF), a term used to describe a general decline in renal function. This buildup is achieved through metabolic disturbances such metabolic acidosis and hyperkalemia, changes in bodily fluid balance, and effects on many other organ systems, the intensity and duration of which depend on the severity of the renal impairment. Severe (requiring dialysis) to mild (serum creatinine concentration increases only) ARF are all possible. One Recent studies reveal a correlation between even slight declines in renal function and increased mortality.[1-3]

Therefore, Acute Kidney Injury (AKI) was adopted to describe the full range of the disease, from mild modifications in indicators of renal function to the need for Renal Replacement Therapy (RRT).[4] To characterize and stratify the severity of AKI, the Acute Dialysis and Quality Initiative Group (ADQI) suggested a new classification in May 2004 called the RIFLE (Risk, Injury, Failure, Loss of kidney function, and End stage renal disease) classification.[5] To improve the diagnostic accuracy of AKI, a revised version of the RIFLE

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was published by the Acute Kidney Injury Network (AKIN) in March 2007.[6] Between 2 and 7 percent of hospitalized individuals have been reported to have AKI.[7,8]
7.2% of patients in a 2002 research on hospital-acquired acute renal insufficiency had an episode of renal insufficiency.[9] The incidence of AKI sustained in a healthcare facility is at least five to ten times higher than that of AKI sustained in the community.[10] Newer nephrotoxic drugs and diagnostic technologies also contribute to this rise in incidence.[7,11]
Anti-inflammatory nonsteroidal anti-inflammatory medications (NSAIDs) and nephrotoxic antibiotics, such as aminoglycosides, are the most common causes of renal toxicity in the elderly.[12] There are a number of age-related changes that occur in the kidney that put a person at risk for experiencing renal side effects from taking a medication. In addition, renal failure was an independent risk factor for mortality,[13] despite the fact that patients with AKI did not die immediately as a result of their renal failure. When kidney failure sets in and RRT is required, the burden of AKI is greatest in low-income nations.[14] Despite the prevalence, severity, treatability, and essentially preventability of AKI, only a small number of studies have been conducted in India utilizing a range of serum creatinine concentrations.[12,15] Therefore, we conducted this research utilizing updated criteria for defining AKI in order to better understand the complex relationship between AKI's underlying causes and their clinical manifestations. The purpose of this study is to examine the demographics, etiology, and treatment outcomes of Acute Kidney Injury (AKI) patients hospitalized to a tertiary care facility.

Material and Methods

Study Design: Following clearance from the Hospital Ethics and Research Committee, a one-year prospective study was undertaken at the Department of General Medicine, SVS Medical College, Yenugonda, Mahabub Nagar, Telangana, India.
Sampling Technique and Sample Size: The study subjects were chosen using the universal sampling technique. After obtaining prior informed agreement, all patients visiting the medical department throughout the study period and meeting the inclusion criteria were included in the study. Both ICU and ward patients were included in the study. 40 patients with various causes of acute kidney injury made up the final sample size.

Inclusion Criteria

1. Age > 18 years
2. People who meet the AKIN criteria

Exclusion criteria

1. End-stage renal disease that has been established, and hemodialysis
2. Demise occurs within one day after admission
3. People who already receive hemodialysis

Study Methodology

Daily contact was maintained with each participant until they were either discharged, passed away, or their kidney function returned to pre-study levels, whichever came first. All patients' demographic, biochemical, and clinical data were captured. At admission and during follow-up, serum creatinine was determined using a buffered kinetic Jaffe reaction without deproteinization. Age, sex, initial disease (medical vs. surgical), AKI (pre-renal, renal, and post-renal), risk factors, indications, and dialysis type and outcomes (recovery, mortality, and dialysis discharge) were also evaluated.

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Data Analysis

The Chi-square test was utilized in order to determine the degree of association between the qualitative variables. A p value of less than 0.05 was considered to be significant. The mean along with the standard deviation and the median along with the interquartile range were used to depict the quantitative data (Interquartile range).

RESULTS

Table 1: Age Distribution

Age (years)	N	%
< 30	10	25%
30 - 50	15	37.5%
50 - 70	20	50%
> 70	5	12.5%
Total	40	100.0%

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 5 (12.5%) patients with age > 70 yrs.

Table 2: Gender Distribution

Sex	N	%
F	10	25%
M	30	75%
Total	40	100.0%

Table 3: 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	15642.0	18036.0	2800.0
S. Calcium	9.1	0.3	8.8
Platelets	190340.6	125910.4	3510.0
S. Sodium	133.8	4.1	121.0
S. Potassium	4.3	0.7	2.7

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 4: Distribution based on S. Urea Levels

S. Urea Levels	Mean	SD	Minimum
On Admission	107.8	59.043	41
On Discharge	51.58	28.602	22
At 3 months	36.26	10.766	23

Mean S. 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 ($p< 0.05$).

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Table 5: Distribution based on S. Creatinine Levels

S. Creatinine	Mean	SD	Minimum
On Admission	4.03	2.3994	1.8
On Discharge	3.2	12.3579	0.9
At 3 months	1.2	0.1413	0.9

Mean S. 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 ($p< 0.05$).

Table 6: Distribution based on Input- output Charting

IO Chart	Mean	SD	Minimum	Maximum
Input on Admission	1556	490.393	200	2900
Output on Admission	880.74	635.446	0	3500
Input on Discharge	1769.42	442.496	800	3200
Output on Discharge	1686.81	479.934	0	2700

Mean input and output volume of patient significantly improved at discharge from their admission values ($p< 0.05$).

Table 7: Distribution based on Urine Analysis

Urine Analysis		N	%
Albumin	Nil/ Trace	11	27.5%
	Present	29	72.5%
Pus Cells (>5)	No	31	77.5%
	Yes	09	22.5%
RBC (>3)	No	30	75%
	Yes	10	25%

Urine Albumin was present in 72.5% patients while pus cells and RBC was present in 22.5% and 25% patients.

Table 8: Distribution based on LFT

LFT	N	%
Normal	33	82.5%
Abnormal	07	17.5%
Total	40	100.0%

Abnormal LFT was observed in 23.2% patients of Acute Kidney Injury.

Table 9: Distribution based on USG Findings

USG Findings	N	%
Normal kidneys	26	60%
Grade 1 RPC	05	12.5%
Grade 2 RPC	03	7.5%
Cystitis	02	5%
Pyelonephritis	02	5%
Prostatomegaly	02	5%
obstructive uropathy	1	2.5%
Total	40	100.0%

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On USG, normal kidneys was observed in over half of the patients while grade I and II RPC was observed. Other findings included Cystitis, Pyelonephritis, Prostatomegaly and obstructive uropathy.

Table 10: Distribution based on Radiological Investigation

Radiological Investigation		**N**	**%**
Chest X-Ray	Normal	30	75%
	ARDS	5	12.5%
	Pul. Oedema	5	12.5%
Echo	Normal	35	87.5%
	Abnormal	5	12.5%

ARDS was observed in 12.5% while pulmonary oedema in 12.5% patients. Abnormal echo findings were observed in 12.5% patients.

Table 11: Distribution based on AKIN Staging

AKIN Stage	**N**	**%**
I	0	0.0%
II	36	90%
III	04	10%
Total	40	100.0%

Out of total patients, 36 (90% %) had stage II AKI, while 04 (10 %) had stage III AKI according to AKIN staging.

Table 12: Distribution based on Dialysis

Dialysis	**N**	**%**
No	36	90%
Yes	04	10%
Total	40	100.0%

A total of 4 (10%) patients were on dialysis while 90% were not on dialysis.

Table 13: Distribution based on Outcome

Outcome	**N**	**%**
Death*	3	7.5%
Recovered	37	92.5%
Total	40	100.0%
* All the deaths were in patients with Sepsis (3/3)		

A total of 3 patients died during the study, all of which were cases of Sepsis.

DISCUSSION

In the Department of General Medicine, SVS Medical College, Yenugonda, Mahabub Nagar, Telangana, India, a hospital-based prospective study was carried out over the course of a single year. Acute kidney injury (AKI) was researched in a total of 40 patients with the intention of determining its genesis, clinical profile, and prognosis. It is common knowledge that the epidemiology of acute kidney injury (AKI) in developing nations varies significantly

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from that of the developed world in a variety of essential respects. In industrialized nations, older people make up the majority of AKI patients; however, in underdeveloped countries, AKI is a disease that mostly affects young adults and children, who are more likely to have volume-responsive "prerenal" mechanisms. This finding is not consistent across all age groups, despite the fact that the total death rate appears to be lower than it is in wealthy countries: In these parts of the world, AKI primarily affects young people and children, and the fatality rate is exceptionally high.[16]

The average age of the participants in the study was 48.9 years, and more than half of the participants were above the age of 50. (Range from 19-87 years). There were 8 patients who were over the age of 70, making up 11.6% of the total. Within our group, the average age was 48.9 years old (range from 19-87 years). The mean age that was reported by Shusterman et al,[3] was 52.4 12, while the mean age that was reported by Shema et al,[17] was 62.3 14.3, and the mean age that was recorded by HS Kohli et al,[12] was 67.9 7.6 years. On the other hand, HS Kohli and colleagues looked at just people above the age of sixty, which is why the mean age in their study was significantly older.[12]

The current study had a male to female ratio of 4.75:1, with 82.6% of participants being male and 17.4% being female. In the study carried out by Kohli et al,[12] as well as by a number of other writers,[3,9,12] it was discovered that the male participants outnumbered the female participants. On admission, the mean S. urea level was 107.8 mg%, at discharge it was 51.6 mg%, and at the three month follow up it was 36.26 gm%. Sixty-eight percent of patients had S. urea levels of less than 40 mg%. At the time of admission, the mean S. creatinine level was 4.03 mg%, but by the time of discharge, it had dropped to 3.26 mg%, and after three months of follow-up, it had reached 1.2 gm% (56% of patients had S. Creat. 1.2 mg%). The difference between admission and discharge, as well as the difference between that and the follow-up at three months, was statistically significant (p 0.05). The patient's mean input and output volume both considerably increased from their admission values to their values when they were discharged (p 0.05). Throughout the duration of treatment, the patients showed steady progress in terms of their renal function, as demonstrated by the test results.

HS According to the findings of Kohli et al,[12] the mean peak blood creatinine level in their group was 4.2 2.21 (2.0- 10.6 mg/dl). In a study conducted by Ravindra et al. to evaluate the mortality and recovery of renal functions in ARF, the mean S. creatinine level on admission was 4.1 mg%, and on discharge, 53% of patients had S. creat. Levels of 1.2 mg%.[18] This data was derived from a study in which the researchers aimed to determine whether or not patients in ARF recover their renal functions. In a trial that was quite comparable to this one, Bouchard et al. noted that the mean S. creatinine level on admission was 2.5 mg%, and that after therapy, 47% of patients had restored normal renal functions by the time they were discharged.[19] HS Kohli et al,[12] reported this in 86.3% of their patients, and AnupamaKaul,[15] reported this in 45% of their patients. Nash et al,[9] reported that complete recovery of renal function occurred in 38.6% of their patients.

Albumin was found in the urine of 56.5% of patients, but pus cells and RBC were found in only 20% and 13% of patients respectively. Albumin is the most common type of protein found in urine. The first sign of chronic kidney disease brought on by diabetes, other glomerular disorders, or hypertensive nephrosclerosis is an increase in the amount of albumin that is excreted in the urine. Albuminuria may also be seen in patients who have polycystic kidney disease, tubulointerstitial disorders, or kidney disease in patients who have received a kidney transplant.[20]

In the current investigation, patients diagnosed with acute kidney injury had abnormal LFT in 23.2% of cases. According to the findings of a study carried out by Bouchard et al., patients diagnosed with Acute Kidney Injury had abnormal liver functions in 27% of their cases.

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CONCLUSION

SVS Medical College conducted a 1-year hospital-based prospective study. Study volunteers were chosen via Universal Sampling. All patients who came to the medicine department throughout the study period and met inclusion criteria gave informed consent. Final sample size was 40 Acute Kidney Injury patients with varying etiologies. Study findings: The average age of the study individuals was 48.9 years (range from 19-87 years). 8 patients (11.6%) were over 70. The M:F ratio was 4.75:1. Mean S. urea level was 107.8 mg% on admission, 51.6 mg% at discharge, and 36.26 gm% at 3 month follow-up (68% had S. urea 40 mg%). Admission, discharge, and 3-month follow-up differences were significant (p0.05). Mean S. Creatinine level was 4.03 mg% on admission, 3.26 mg% at discharge, and 1.2 gm% at 3 month follow up (56% of patients had S. Creat. 1.2 mg%). Admission, discharge, and 3-month follow-up differences were significant (p0.05). 56.5% of patients had urine albumin, while 20.3% and 13% had pus cells and RBC. Over half of patients had normal kidneys on USG, while 30.4% and 4.3% had grade I or II RPC. Cystitis, Pyelonephritis, Prostatomegaly, and obstructive uropathy were found. 10.1% had ARDS and 4.3% had pulmonary oedema. 5.8% had abnormal echo results. Sepsis (14.5%) and Malaria (14.5%) were the most common causes of AKI, followed by Dengue, AGI, and Leptospirosis (11.6%).

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