

Original Research Article

EXAMINING THE INCIDENCE OF ACUTE KIDNEY INJURY ASSOCIATED RISK FACTORS AND OUTCOMES IN INDIAN MEDICAL ICU

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ABSTRACT

Background: Acute injury to the kidneys depicts a serious complication encountered in the subjects admitted to Intensive care unit associated with high mortality and morbidity rates. Common causes being nephrotoxic interventions, hypotension, sepsis, and systemic illnesses. Early identification and treatment are vital for better outcomes. The present study was aimed to examine the incidence of acute kidney injury associated risk factors and outcomes in Indian medical ICU focusing on comorbidities and effect of interventions as dialysis.

Materials and Methods: The present study assessed 200 subjects admitted to ICU of the Institute within the defined study period with acute kidney injury following KDIGO data. In all subjects, demographics were recorded along with etiology, comorbidities, and outcomes. The data gathered were statistically assessed for results.

Results: The study results showed that sepsis was the major cause for AKI with infections as malaria being significant contributor. The mortality rate was 62% for malaria associated acute kidney injury. The most common comorbidity was hypertension and diabetes mellitus. Subjects that underwent dialysis had significant better recovery of 97% compared to subjects without dialysis with 68%. Overall, 64% subjects showed recovery and 24% subjects died.

Conclusion: The present study concludes that there is a high incidence of acute kidney injury in subjects admitted to intensive care unit in India with the main etiologic agent being infection. Early and timely dialysis along with effective management of underlying etiology can significantly improve the outcomes in affected subjects.

Keywords: acute kidney injury, dialysis, intensive care unit, sepsis

INTRODUCTION

AKI or acute kidney injury is a commonly seen complication in subjects that are critically ill and admitted to ICU (intensive care unit) and assessed as abrupt kidney function loss. It adversely affects the healthcare costs, mortality, morbidity, and clinical outcomes. The Global data reports that AKI is seen in nearly 50% subjects in ICU with varying incidence based on healthcare setting and population. Despite various advancements in ICU medicine, AKI remains a significant challenge owing to nephrotoxic exposure, hypovolemia, sepsis, and other multifactorial etiologies. In ICU, AKI is usually an

interplay of treatment-related factors and systemic illnesses. Conditions as hypotension and sepsis are major contributor of hypoperfusion, whereas, therapeutic interventions as mechanical ventilation and vasoactive drugs can further exacerbate stress on kidneys. The ICU environment make it vital to identify and address these factors to halt progression of AKI. Previous literature data reports that early assessment and targeted management are vital to decrease mortality rates, decreasing the risk of CKD transition, and improving the patient outcomes.^[1]

AKI burden is not uniform and varies by institution, geographic, and demographic data. In India which is socioeconomically diverse and various health

determinants, it provides a unique environment to study AKI. Existing literature data is scarce in India concerning risk factors, comorbidities, and demographic data in ICU subjects developing AKI. Understanding the aspects can help the development of specific protocols and better outcomes in Indian subjects.^[2]

Comorbidities such as cardiovascular diseases, hypertension, and diabetes mellitus are well considered factors for AKI. These conditions predispose subjects to increased susceptibility to nephrotoxic causes, endothelial dysfunction, and hemodynamic instability. Also, the AKI prevalence is high in elderly subjects most likely from high burden of comorbidities and decreased kidney reserve. Identification of these high-risk groups is vital for decreasing prevention strategies as avoiding unnecessary nephrotoxic therapies and optimum fluid management.^[3]

The outcomes of AKI in ICU admitted subjects are multifactorial with the range of progression to CKD (chronic kidney disease) and ESRD (end stage renal disease) to complete recovery. Mortality rate in subjects with AKI admitted to ICU are significantly high and in range of 30-50% based on underlying etiology and severity. Recovery in these subjects are largely affected by various factors as adequate supportive care, onset severity, and time of identifying AKI. In severe cases, RRT (renal replacement therapy) is usually done, however, its use is associated with resource implications and risks. Recent evidence focusses on importance of individualized decision making.^[4] The present study was aimed to examine the incidence of acute kidney injury associated risk factors and outcomes in Indian medical ICU focusing on comorbidities and effect of interventions as dialysis.

MATERIALS AND METHODS

The present retrospective observational study was aimed to examine the incidence of acute kidney injury associated risk factors and outcomes in Indian medical ICU focusing on comorbidities and effect of interventions as dialysis. The study subjects were from Department of General Medicine of the Institute. Verbal and written informed consent were taken from all the parents of the subjects before study participation.

The present study assessed 200 subjects admitted to ICU of the Institute within the defined study period with acute kidney injury following KDIGO data. In all subjects, demographics were recorded along with etiology, comorbidities, and outcomes. The data gathered were statistically assessed for results.

The inclusion criteria for the study were subjects aged more than 18 years with the decreased urine output, urine output of <0.5 ml/kg/hour, serum creatinine >0.3mg/dL in past 48 hours or >1.5 times from baseline within 7 days, and AKI diagnosis confirmed with KDIGO criteria, a and complete medical records

and data. The exclusion criteria for the study were subjects with CKD, pregnant females, and subjects aged <18 or >90 years.

After final inclusion, data from all the subjects was collected on preformed structured proforma. Clinical and demographic data were assessed in all the subjects including AKI outcomes, comorbidities, symptoms, gender, and age of the study subjects. This was followed by various investigations as ultrasound of the abdomen, creatinine clearance, eGFR, bicarbonate levels, urine analysis, calcium, phosphate, serum electrolytes, renal function tests, and complete blood counts. The outcomes assessed in the study subjects were mortality rate or death, progression to CKD (chronic kidney disease) and recovery outcomes as restoration of kidney functions to the baseline.

Statistical analysis of the collected data was done with Fisher's exact test, Chi-square test, Mann Whitney U test, and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA) was used along with the ANOVA and student's t-test. The significance level was considered at a p-value of <0.05.

RESULTS

The present retrospective observational study was aimed to examine the incidence of acute kidney injury associated risk factors and outcomes in Indian medical ICU focusing on comorbidities and effect of interventions as dialysis. The present study assessed 200 subjects admitted to ICU of the Institute within the defined study period with acute kidney injury following KDIGO data. In all subjects, demographics were recorded along with etiology, comorbidities, and outcomes. The data gathered were statistically assessed for results.

It was seen that for association in outcomes of acute kidney injury and various comorbidities, in subjects with both diabetes and hypertension, 60% (n=6) subjects recovered and 40% (n=4) subjects died with non-significant difference and p-value of 0.37. Similar non-significant difference was seen in death and recovery rate in subjects with ischemic heart disease, chronic liver disease, hypertension, and diabetes mellitus with the p-values of 0.13, 0.13, 0.77, and 0.08 respectively [Table 1].

The study results showed that for association in AKI outcomes and specific etiology in study subjects, in liver-related etiologies, 77.7% (n=14) subjects recovered and 22.2% (n=4) subjects died depicting a statistically non-significant difference with p=0.87. Similar non-significant difference in death and recovery rate in etiologies as cardiac, obstructive uropathy, post-partum AKI, sepsis and infection and other with p-values of 0.14, 0.13, 0.92, 0.13, and 0.91 respectively. Total deaths were 48 and recovery was reported in 152 subjects [Table 2].

It was also seen that for association in outcome of AKI and sepsis and infection related etiology in study

subjects, in subjects with UTI, death was reported in 30% (n=6) subjects and recovery in 70% (n=14) subjects which was non-significant with p=0.62. Similar non-significant difference was seen in death and recovery rate in subjects with LRTI (lower respiratory tract infection), AGE, and viral etiologies

with p-values of 0.78, 0.64, and 0.47 respectively. For other etiologies, non-significant difference was seen in death and recovery rates with p=0.73. However, a significant difference was seen with higher death rate compared to recovery rate in subjects with malaria with the p-value of 0.007 [Table 3].

Table 1: Association in outcomes of acute kidney injury and various comorbidities

S. No	Comorbidity	Death n	Death %	Recovery n	Recovery %	p-value
1	Both diabetes and hypertension	4	40	6	60	0.37
2	Ischemic heart disease	0	0	12	100	0.13
3	Chronic liver disease	0	0	12	100	0.13
4	Hypertension	10	26.3	28	73.6	0.77
5	Diabetes mellitus	12	42.8	16	57.1	0.08

Table 2: Association in AKI outcomes and specific etiology in study subjects

S. No	Etiology	Death n	Death %	Recovery n	Recovery %	p-value
1	Liver-related	4	22.2	14	77.7	0.87
2	Cardiac	0	0	14	100	0.14
3	Obstructive uropathy	0	0	12	100	0.13
4	Post-partum AKI	4	25	12	75	0.92
5	Sepsis and infection	34	29.8	80	70.1	0.13
6	Others	6	23	20	77	0.91
7	Total	48		152		

Table 3: Association in outcome of AKI and sepsis and infection related etiology in study subjects

S. No	Sepsis and infection	Death n	Death %	Recovery n	Recovery %	p-value
1	UTI	6	30	14	70	0.62
2	LRTI	6	21.4	22	78.5	0.78
3	AGE	2	16.6	10	83.3	0.64
4	Viruses	6	33.3	12	66.6	0.47
5	Malaria	10	62.5	6	37.5	0.007
6	Others	4	20	16	80	0.73
7	Total	34		80		

DISCUSSION

The present study assessed 200 subjects admitted to ICU of the Institute within the defined study period with acute kidney injury following KDIGO data. In all subjects, demographics were recorded along with etiology, comorbidities, and outcomes. The data gathered were statistically assessed for results. The design of this study was similar to the previous studies of Coca SG et al,^[5] in 2009 and Prakash J et al,^[6] in 2010 where study design similar to the present study were also reported by the authors in their studies.

The study results showed that for association in outcomes of acute kidney injury and various comorbidities, in subjects with both diabetes and hypertension, 60% (n=6) subjects recovered and 40% (n=4) subjects died with non-significant difference and p-value of 0.37. Similar non-significant difference was seen in death and recovery rate in subjects with ischemic heart disease, chronic liver disease, hypertension, and diabetes mellitus with the p-values of 0.13, 0.13, 0.77, and 0.08 respectively. These results were in line with the findings of Prakash J et al,^[7] in 2013 and Kute VB et al,^[8] in 2012 where reported by the authors were comparable to the results of the present study.

It was seen that for association in AKI outcomes and specific etiology in study subjects, in liver-related

etiologies, 77.7% (n=14) subjects recovered and 22.2% (n=4) subjects died depicting a statistically non-significant difference with p=0.87. Similar non-significant difference in death and recovery rate in etiologies as cardiac, obstructive uropathy, post-partum AKI, sepsis and infection and other with p-values of 0.14, 0.13, 0.92, 0.13, and 0.91 respectively. Total deaths were 48 and recovery was reported in 152 subjects. These findings correlated with the results of Prakash J et al,^[9] in 2013 and Devarajan P,^[10] in 2011 where association in AKI outcomes and specific etiology comparable to the present study was also reported by the authors in their studies.

It was noted that for association in outcome of AKI and sepsis and infection related etiology in study subjects, in subjects with UTI, death was reported in 30% (n=6) subjects and recovery in 70% (n=14) subjects which was non-significant with p=0.62. Similar non-significant difference was seen in death and recovery rate in subjects with LRTI (lower respiratory tract infection), AGE, and viral etiologies with p-values of 0.78, 0.64, and 0.47 respectively. For other etiologies, non-significant difference was seen in death and recovery rates with p=0.73. However, a significant difference was seen with higher death rate compared to recovery rate in subjects with malaria with the p-value of 0.007. These results were in agreement with the findings of Gines PSR,^[11] in 2009 and Prakash J et al,^[12] in 2010

where association in outcome of AKI and sepsis and infection related etiology reported by the authors was comparable to the results of the present study.

CONCLUSION

Within its limitations, the present study concludes that there is a high incidence of acute kidney injury in subjects admitted to intensive care unit in India with the main etiologic agent being infection. Early and timely dialysis along with effective management of underlying etiology can significantly improve the outcomes in affected subjects.

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