A PROSPECTIVE STUDY OF CLINICAL PROFILE OF PATIENTS ADMITTED WITH ACUTE KIDNEY INJURY IN INTENSIVE CARE UNIT

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Abstract

Introduction: Acute kidney injury (AKI), formerly known as acute renal failure, is a condition in which nitrogenous and other waste products are retained due to sudden impairment of renal function. It initiates a cascade of renal damage ranging from mild to severe forms. The condition is common in critically ill hospitalized patients. The mortality and incidence are as high as 82% and 31% respectively in some parts of the world. It suggests that AKI is a major risk factor for mortality in the intensive care unit (ICU).

Materials and methods: This prospective observational study was conducted in an ICU of Department of Nephrology, Guntur Medical College, Guntur from January 2023 to December 2023. Patients admitted to the ICU who were 18 years of age and had diagnosis of AKI by KDIGO criteria were included in the study. Staging of AKI was based on KDIGO guidelines. Informed written consent was obtained from all patients. Standard demographic data (age, gender and date of admission) was obtained from all participants enrolled. Clinical and physiological data collected included the diagnosis at admission, presence of co-morbidities (hypertension, diabetes mellitus and coronary artery disease) and the requirement of mechanical ventilation.

Results: Total number of patients included in the study was 200, of which 114 were males and 86 were females. Mean age of the patients included in the study was 54.9 ± 14.55 yrs. Seventy two percent patients had comorbidities. Diabetes mellitus was the most common comorbidity seen in 38% cases followed by Hypertension in 27%. The duration of ICU stay ranged from 4 days to 12 days with an average of 6.9 days. Respiratory tract infection was seen in 25% of the study population. The other sites of infection were genitourinary tract (12%) and gastrointestinal tract (4%).

Conclusion: Sepsis was the most common aetiological factor responsible for AKI. Diabetes mellitus was found to be the most common comorbid illness associated with development of acute kidney injury. Respiratory tract infection was found to be the most common diagnosis at admission among those with AKI. Most AKI in ICU have oliguria. Acute tubular necrosis was found to be the most common pathophysiological process responsible for AKI. Forty-five

percent of ICU-AKI patients require RRT. SOFA score of ≥9 and increasing severity of AKI were associated with increased mortality and also poor rate of recovery from acute kidney injury and increased mortality.

Key Words: Acute kidney injury, intensive care unit, Diabetes mellitus, Hypertension.

INTRODUCTION

Acute kidney injury (AKI), formerly known as acute renal failure, is a condition in which nitrogenous and other waste products are retained due to sudden impairment of renal function. It initiates a cascade of renal damage ranging from mild to severe forms.[1] The condition is common in critically ill hospitalized patients. The mortality and incidence are as high as 82% and 31% respectively in some parts of the world. It suggests that AKI is a major risk factor for mortality in the intensive care unit (ICU).[2]

However, the incidence and mortality varied worldwide. Besides, significant difference also exist in the epidemiology and outcomes of AKI in various countries. More than 85% of the AKI burden comes from developing countries, while the AKI associated mortality rate is higher in developed countries.[3] The major factor behind the higher incidence of AKI in developing countries, like India, is the higher risk of community-acquired AKI (CAAKI).[2,3]The patients are relatively younger without coexisting morbidities. As CAAKI occurs due to a single causative agent and is hence reversible, the associated mortality rate is lower. On the other hand, the higher AKI associated mortality in developed countries is attributed to the higher proportion of elderly patients with comorbidities ,who tend to acquire hospitalization related AKI. Instead of a high incidence rate and considerable reported mortality associated with AKI, there is no nationwide registry in India.[4]

The Indian ICUs lack significant experience regarding AKI and use data from single-center studies only. The hospital-acquired AKIs are found under-recognized and reported in developing countries. Additionally, the vast geographical and socioeconomic diversity in India, the regional differences in the epidemiology and outcomes of AKI are present. Owing to these facts and the single-center, retrospective designs of the existing studies limit the generalization of their results.[5]

MATERIALS AND METHODS

This prospective observational study was conducted in an ICU of Department of Nephrology, Guntur Medical College, Guntur from January 2023 to December 2023.

Patients admitted to the ICU who were 18 years of age and had diagnosis of AKI by KDIGO criteria were included in the study. Staging of AKI was based on KDIGO guidelines.

Informed written consent was obtained from all patients. Standard demographic data (age, gender and date of admission) was obtained from all participants enrolled. Clinical and physiological data collected included the diagnosis at admission, presence of co-morbidities (hypertension, diabetes mellitus and coronary artery disease) and the requirement of mechanical ventilation. Physiological data included the Glasgow Coma Scale (GCS), PaO2/ FiO2 ratio, electrolytes, bilirubin and blood counts. The data on renal function included urine microscopy, blood urea, serum creatinine and urine output. The investigations were repeated when deemed warranted by the treating physician. Severity of illness on admission and during ICU stay was assessed using the SOFA score. Duration of ICU stay was noted. Patients were followed up till being transferred out from ICU.

RESULTS

Total number of patients included in the study was 200, of which 114 were males and 86 were females. Mean age of the patients included in the study was 54.9 ± 14.55 yrs. Seventy two percent patients had comorbidities. Diabetes mellitus was the most common comorbidity seen in 38% cases followed by Hypertension in 27%. The duration of ICU stay ranged from 4 days to 12 days with an average of 6.9 days. Respiratory tract infection was seen in 25% of the study population. The other sites of infection were genitourinary tract (12%) and gastrointestinal tract (4%).

Comorbidities	Number of patients
Chronic Liver Disease with Portal Hypertension	10
Chronic Obstructive Pulmonary Disease	28
Diabetes Mellitus	76
Hypertension	54
Ischaemic Heart Disease	24
Seizure Disorder	6

Table 1: Comorbidities of Patients

Primary diagnosis	Number of patients
Respiratory Tract Infections	50
Urinary Tract Infections	24
Gastrointestinal Tract Infections	8
Ischaemic Heart Disease	10
Poisoning and Envenomation	12
Leptospirosis	16
Dengue	2
Malaria	10
Chronic Liver Disease with Portal Hypertension	2

Cerebrovascular Accident	14
Diabetic Ketoacidosis	8
Acute Pancreatitis	8
Metabolic Encephalopathy	8
Chronic Obstructive Pulmonary Disease with Type 2 Respiratory Failure	8
Skin and Soft Tissue Infections	4
Meningoencephalitis	2
Seizure Disorder	4
Neuroleptic Malignant Syndrome	2

Table 2: Primary Diagnosis of Patients admitted with AKI

Aetiology	Number of patients
Sepsis	102
Sepsis and Drugs	44
Envenomation and Poisoning	12
Nephrotoxic Drugs	12
Sepsis and Volume Loss	12
Sepsis, Drugs and Hypotension	10
Hypotension	4
Volume Loss	4

Table 3: Aetiology of AKI in ICU

Sepsis was found to be the major cause for Acute Kidney Injury with almost 51% of AKI being attributed to it. Twenty-two percent of those with AKI were found to be in Stage 1, 44% in Stage 2 and 34% in Stage 3. Oliguria was found to be present in 70% of those with AKI. Acute tubular necrosis was present in 58% of patients.

Forty-five percent of patients required haemodialysis. The rest were managed conservatively. Twenty-six percent of patients in our study required Mechanical Ventilatory support. Among those who required mechanical ventilator, 32 were males and 20 were females. Fifty-seven percent of patients recovered from AKI. Inotropes were required in 37% of patients. The mortality rate was 26%.

DISCUSSION

The study included 200 subjects, of which 57% were males and 43% were females. In the study conducted by Prakash et al, 56.5% were males and 43.5% were females. In a similar study conducted by Wijewickrama et al, 61.5% were males and 38.5% were females. The mean age of patients included in the study was 54.9 yrs. with a standard deviation of 14.55. Prakash et al in his study found the mean age to be 44.9 ± 17.1 yrs. In the study done by Wijewickrama et al, mean age was found to be 47.8 yrs. with a SD of 19.4 yrs. Wen Y et al in his study found that the mean age was 62 yrs. with a SD of 12 yrs.[6]

Seventy-two percent of subjects had one or more comorbidities. Diabetes mellitus was found to be the most common co-morbid illness associated with AKI (38%) followed by hypertension (27%), COPD (14%) and ischaemic heart disease (12%).[7]

In the study conducted by Prakash et al, 52.70% of patients had other co-morbid illness with hypertension being the most common (34.7%) followed by coronary artery disease (30.4%) and diabetes mellitus (28.3%). A higher percentage of patients with AKI had comorbidities in our study as compared to Prakash et al. This may be due to changing profile of admissions to hospital or increased incidence of non-communicable diseases in the general population.[8]

The duration of ICU stay ranged from a minimum of 4 days to maximum of 12 days with an average of 6.9 ± 1.7 days. In the study conducted by Prakash et al, mean duration of ICU stay was found to be 6.41 ± 4.81 days.[9]

Oliguria was found in 70% of those with AKI. This was similar to the findings of Prakash et al, where oliguria was seen in 65.2% of patients with AKI.

Most causes of AKI are multifactorial and exact underlying pathology is difficult to discern. Acute Tubular Necrosis was found to be one of the major pathophysiological cause for AKI (58%).[10]

CONCLUSION

Sepsis was the most common aetiological factor responsible for AKI. Diabetes mellitus was found to be the most common comorbid illness associated with development of acute kidney injury. Respiratory tract infection was found to be the most common diagnosis at admission among those with AKI. Most AKI in ICU have oliguria. Acute tubular necrosis was found to be the most common pathophysiological process responsible for AKI. Forty-five percent of ICU-AKI patients require RRT. SOFA score of ≥9 and increasing severity of AKI were associated with increased mortality and also poor rate of recovery from acute kidney injury and increased mortality.

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