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Original Research Article

Clinical profile and outcomes of acute kidney injury patients in an intensive care unit in India

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ABSTRACT

Background: The limited epidemiological and outcome data of acute kidney injury (AKI) is available in developing countries. The current single-center study determined the clinical profile of AKI by attempting to identify the presenting symptoms, etiologies, treatment modalities, and disease prognosis in patients admitted in intensive care unit at a tertiary care center in Mangalore, India.
Methods: This retrospective study enrolled 70 AKI patients between October 2001 and October 2003, admitted at Wenlock district hospital, Mangalore, KMC hospital Attawar, Mangalore and KMC hospital, Jyothi circle, Mangalore, having a serum creatinine level greater than 1.4 mg/dl and blood urea greater than 53 mg/dl.
Results: Amongst the enrolled patients, 45.7% of patients were 40-60 years old and 49 were males with no significant (p=0.412) gender difference. The most common presenting symptom was diminished micturition present in 47.1% of patients and the most common etiology of AKI was sepsis found in 27.1% of patients with the highest (17.1%) mortality. Amongst the patients who underwent conservative treatment (n=52) the mortality rate was 42.8%, while in those who underwent hemodialysis (n=18) the mortality rate was 4.2%. The overall survival rate in the study was 52.9%.
Conclusions: The epidemiological data obtained in this study is similar to the previous studies in India with hemodialysis appearing to have better disease outcomes compared to conservative therapy.

Keywords: Acute kidney injury, Sepsis, Hemodialysis, Conservative therapy

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.[1] It suggests that AKI is a major risk factor for mortality in the intensive care unit (ICU).

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.[2] 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.[2,4] Instead of a high incidence rate and considerable reported mortality associated with AKI, there is no nationwide registry in India. The Indian ICUs lack significant experience regarding AKI and use data from single-center studies only.[5-8] The hospital-acquired AKIs are found under-recognized and reported in developing countries.[9] 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.

The current single-center study determined the clinical profile of AKI by attempting to identify the presenting symptoms, etiologies, treatment modalities, and disease prognosis in patients admitted in the ICU at a tertiary care center in India.

METHODS

This retrospective study enrolled 70 AKI patients, admitted at Wenlock district hospital, Mangalore, KMC hospital Attawar, Mangalore and KMC hospital, Jyothi circle, Mangalore, between October 2001 and October 2003 at having a serum creatinine level greater than 1.4 mg/dl and blood urea greater than 53 mg/dl. The AKI patients aged less than 16 years at the time of enrollment and ultrasound evidence of bilaterally small kidneys suggestive of chronic renal failure were excluded from the study. The study was conducted following the declaration of Helsinki. The consent was obtained from all the patients before enrollment.

Evaluation included a detailed history taking (includes past medical and/or surgical history, signs of azotemia (nausea and vomiting), altered sensorium, or other symptoms associated with AKI), clinical examination for assessing volume status (includes skin examination for poor skin turgor, dry skin, and mucous membrane, lack of axillary sweating; cardiovascular system examination for assessment of peripheral vasculature, valvular heart disease, blood pressure drop, gallop rhythm, cardiomegaly; respiratory system examination for pleural effusion, pulmonary edema; gastrointestinal system examination for ascites, hepatomegaly, large kidneys, paralytic ileus; central nervous system assessment of encephalopathy, asterixis, head injuries; and musculoskeletal system examination for signs of rhabdomyolysis) and laboratory investigations. Patients were followed up until discharge or death. Hemodialysis was conducted as and when required.

Statistical analysis

The categorical variables were expressed as frequencies and percentages, and continuous variables as mean and standard deviation. The data were analyzed using statistical package for the social sciences (SPSS) version 20.

RESULTS

Amongst 70 patients enrolled in the study, 45.7% of patients lied in the age group of 40-60 years and 49 were males with no significant (p=0.412) gender difference in the included population (Table 1). The presenting symptom, diminished micturition was present in 47.1% of patients followed by fever in 42.9% (Table 2). In 71.4% of patients, no renal parenchymal changes were observed on ultrasound, while remaining (28.6%) patients showed grade 1 renal parenchymal changes (Table 3). A maximum number of patients underwent conservative treatment, amongst the mortality rate was 42.8% (Table 4). While in the patients who underwent hemodialysis, the mortality rate was 4.2%. The overall survival rate in the study was 52.9% (Table 5). The most common etiology for acute renal failure (ARF) in the included population was sepsis found in 27.1% of patients, followed by malaria (8.5%), cirrhosis (7.1%), cardiogenic shock (7.1%), leptospirosis (7.1%), and snake bite (7.1%) (Table 6).

Table 1: Demographic characteristics.

Age group (years)	Age distribution		Sex distribution		
	Freq	%	Male	Female	Total
<20	2	2.9	1	1	2
20-30	8	11.4	4	4	8
30-40	8	11.4	8	0	8
40-50	19	27.1	13	6	19
50-60	13	18.6	8	5	13
60-70	7	10.0	5	2	7
>70	13	18.6	10	3	13

Table 2: Presenting symptoms

Symptoms	Frequency	Percentage
Fever	30	42.9
Breathlessness	12	17.1
Skin lesions	1	1.4
Muscle pain	16	22.9
Pedal edema	15	21.4
Abdominal pain	15	21.4
Diminished micturition	33	47.1
Nausea and vomiting	19	27.1
Altered sensorium	17	24.3
Bleeding	1	1.4
Chest pain	6	8.6
Cough	14	20.0
Syncope	2	2.9
Dysuria	1	1.4
Trauma	3	4.3
Hemolysis	2	2.9
Icterus	16	22.9
Diarrhea	8	11.4
Dysphagia	1	1.4
Headache	5	7.1
Blood loss	1	1.4
Seizures	2	2.9
Backache	1	1.4
Facial puffiness	2	2.9
Hiccoughs	1	1.4

Table 3: Clinical examinations.

Blood parameters	Mean (mg/dl)	Standard deviation
Hemoglobin	10.22	2.70
Urea	118.07	53.07
Creatinine	3.65	2.56
Ultrasonography findings in renal parenchyma	**Frequency**	**Percentage**
Grade 1	20	28.6
No changes	50	71.4

Table 4: Treatment modalities.

Treatment	Frequency	Percentage
Conservative	52	74.3
Hemodialysis	18	25.7

Table 5: Treatment outcomes.

Outcome	Frequency	Percentage
Survival	37	52.9
Mortality	33	47.1
Mortality after conservative therapy	30	42.8
Mortality after hemodialysis	3	4.2

Table 6: Etiologies of acute kidney injury and respective mortality rates.

Etiology	Frequency	Percentage	Mortality rate (%)
Systematic lupus erythematous	2	2.8	-
Snake bite	5	7.1	
Leptospirosis	5	7.1	4.2
Cellulitis	2	2.8	1.4
Cerebrovascular accident	2	2.8	2.9
Copper sulphate poisoning	3	4.2	-
Viral hepatitis	1	1.4	-
Sepsis	19	27.1	17.1
Cardiogenic shock	5	7.1	5.7
Fracture femur	3	4.2	2.9
Gastroenteritis	4	5.7	1.4
Glomerulonephritis	2	2.8	-
Malaria	6	8.5	2.9
Deep vein thrombosis	1	1.4	-
Puerperal sepsis	2	2.8	1.4
Cirrhosis	5	7.1	4.2
Non-Hodgkin lymphoma	1	1.4	1.4
Obstructive uropathy	1	1.4	-
Malignant hypertension	1	1.4	-

DISCUSSION

The clinical profile and outcomes of AKI in the current study are different than studies from developed countries. Compared to these studies, in the current study, the relatively younger patients had AKI. However, most of the Indian studies had reported AKI between 40-60 years of age. The most common clinical presentation in our study was diminished micturition (47.1%) followed by fever, and nausea and vomiting. In a similar study by Mahajan et al most commonly oliguria was observed in 71.1% of AKI patients. Further, in the univariate analysis, they found oliguria as one of the significant predictors of mortality.[10]

In the current study, sepsis in the most common etiology of AKI in 27.1% of the included population and also the leading (17.1%) cause of mortality. Sepsis is found to be leading etiology for AKI in other parts of the world.[4,11] In India, various studies reported the proportion of sepsis in the etiology of AKI between 31% and 86%.[5-8] The wide range reflects the socioeconomic and regional differences that might affect epidemiology in the various regions of the country. Sepsis and septic shock increase the risk of organ dysfunction and death. In the current study, the AKI patients with cardiogenic shock showed 80% mortality. It is also supported by data from the European dialysis and transplant association (EDTA) - European renal association. They showed that mortality after AKI alone is far lower than if AKI is associated with one or more organ dysfunction.[12]

Additionally, in the current study, the identifiable focus of sepsis is muscle and abdominal pain. The incidence of sepsis and infection is also reflected by the high proportion of fever in the current cohort of the population. Some previous Indian studies found lung and abdomen as the identifiable reason for sepsis.[5,13] The tropical environment and poor living conditions are responsible for infections and sepsis. Hence, early prevention of sepsis will decrease the incidence of AKI. Additionally, muscle pain could be attributed to rhabdomyolysis, which is also the leading cause of AKI.[14] However, it could not be substantiated in our study as it requires enzymatic evaluation such as creatinine kinase and lactate dehydrogenase, which was not conducted in our study.

Other preventable single medical conditions for AKI include infections such as dengue and leptospirosis. However, the etiological comparison in the studies from various parts is impossible due to the difference in the epidemiology. Chugh et al studied changing etiological trends of AKI in low-income countries over 21 years.[15] They found that sepsis and drug-induced poisoning are becoming the major etiologies whereas the proportion of obstetric and copper sulfate poisoning related AKI is decreasing. In the current study, sepsis is the major etiology. While obstetric and copper sulfate poisoning related AKI is very low.

In the current study, renal replacement therapy given by hemodialysis constituted 25.7% of patients. The rate of hemodialysis in this study is comparatively lower than in other studies in India.[7,13] The low dialysis rate may be due to the high cost of the treatment and the non-feasibility of the procedure in the developing countries. However, some studies from India reported a very high (>75%) rate of hemodialysis.[10,16]

The mortality rate in the study was 47.1% found similar to a few studies conducted in India.[10,13,17] However, in other studies from India, the mortality rate varies from as low as 7.8% to as high as 90%.[7,16] The drastic difference in the outcomes after AKI is due to the difference in the demographic characteristics of patients, variations in referral patterns as well as admission policies of ICUs. Considering the treatment outcomes, in the current study mortality rate is numerically higher after conservative therapy compared hemodialysis. Maxvold et al suggested that renal replacement therapy is the effective management of AKI.[18]

Limitations

The major limitation of the study included a relatively small patient population admitted at a single center and a retrospective design, which has overestimated the associated etiologies and outcomes compared to any primary and community-based center.

CONCLUSION

The epidemiological data obtained in this study is quite similar to the previous studies in India. The sepsis was identified as the most common etiology of AKI with the highest mortality, while oliguria found as the most frequent clinical presentation. Additionally, in this cohort of patients, hemodialysis appears to have better disease outcomes compared to conservative therapy.

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