

Acute Kidney Injury: Clinical Characteristics And Outcomes

Maskey A, Baidya S, Poudel P, Poudel S, Manandhar DN, Chhetri PK

Department of Nephrology, Nepal Medical College Teaching Hospital, Kathmandu

Corresponding Author: Dr. Abhishek Maskey, MD, DM (Nephrology), Department of Nephrology, Nepal Medical College Teaching Hospital, Kathmandu, Nepal; E-mail: maskey21@hotmail.com

ABSTRACT

Acute kidney injury (AKI) is a heterogeneous disorder with multiple etiologies, risk factors and clinical presentations. AKI is an increasingly common condition occurring due to various causes. It is associated with significant morbidity and mortality and often necessitates renal replacement therapy. A prospective, observational study was conducted in the Department of Nephrology in Nepal Medical College Teaching Hospital from 5th June 2012 to 4th December 2013. Diagnosis of acute kidney injury was made as per criteria of "Kidney Disease: Improving Global Outcomes (KDIGO) guidelines 2012". A total of 84 subjects diagnosed with AKI were included in the study. The male to female ratio was 1:1. The mean age of the studied population was 48 ± 20 years. Average duration of presentation was 9 days. Among the primary cause of AKI, 44 % was due to sepsis in which urinary tract infection (55%) was the major cause. Among the comorbid conditions, 35.7% subjects had diabetes mellitus. Average urea and creatinine of patients who did not need hemodialysis were 103.7 and 3.3 mg/dL respectively while those who underwent hemodialysis had higher urea (167 mg/dL) and creatinine (7.6mg/dL). Fifteen percent cases received hemodialysis, out of which 78 % underwent intermittent hemodialysis and 22 % underwent sustained low efficiency dialysis. Fifty two percent cases had full recovery in renal function and 3 % cases expired. Our study showed the major cause of AKI was sepsis due to urogenital infections. Early detection using standardized definition of AKI, avoidance of nephrotoxic agents and early, aggressive and appropriate interventions result in improved patient outcomes.

Keywords: Acute kidney injury, Sepsis, Sustained low efficiency dialysis (SLED)

INTRODUCTION

Acute kidney injury (AKI) is a relatively common condition in the intensive care unit and occurs in 20% to 30% of critically ill patients, with approximately 6% eventually requiring renal replacement therapy.¹ AKI is associated with high mortality and morbidity in critically ill patients.² The causes of AKI are multifactorial and vary in different parts of the world and perhaps vary within the same country. The aim of the study was to determine various clinical characteristics of patients with AKI and its outcome.

MATERIALS AND METHODS

We carried out a prospective single center study from 5th June 2012 to 4th December 2013. A total of 84 patients, who fulfilled the diagnosis of acute kidney injury according to KDIGO guidelines 2012, were included in our study. Detailed history, clinical examination and investigations were carried out on all patients. Hemodialysis was performed according to standard indications. Patient who became dialysis independent with good urine output and renal function were discharged and followed up for 3 months. Complete renal recovery was defined as serum creatinine < 1.4 mg/dl, partial renal recovery was defined as serum creatinine >

1.4 mg/dl with no need for maintenance dialysis and no renal recovery was defined as need for permanent renal replacement therapy.

RESULTS

Out of 84 patients with acute kidney injury during the study period, 44 were males and 40 were females. The mean age of the studied patients was 48 ± 20 years (range 14-89). The average duration of presentation was 9 days. Thirty seven (44%) of studied population of AKI were due to sepsis followed by hypovolemia in 20 cases (24%), obstruction in 11 cases (13%), glomerular disease in 10 cases (12%) and nephrotoxic drugs in 6 cases (7%) (Table 1). The maximum number of patients in sepsis due to urinary tract infection were 20 (55%), followed by respiratory tract infection. (Table 2)

Table 1: Etiology of AKI

Causes of AKI	Number	Percentage
Sepsis	37	44
Hypovolemia	20	24
Obstruction	11	13
Glomerulonephritis	10	12
Drug induced	6	7

Table 2: Site of infection

Site	Number	Percentage
Urinary tract	20	55
Respiratory	11	30
Leptospira	2	5
Infective endocarditis	2	5
Gastrointestinal	2	5

Among comorbid conditions, 30 (35.7%) subjects had type 2 diabetes mellitus followed by hypertension in 24 cases (29.7%), chronic obstructive airway disease in 14 cases (16.6%) and malignancy in 6 cases (7%)(Table 3).

Table 3: Comorbid condition

Comorbid condition	Number	Percentage
Diabetes mellitus	30	35.7
Hypertension	24	29.7
COPD	14	16.6
Cancer	6	7

Average urea and creatinine at admission, among patients who did not need hemodialysis were 103.7 and 3.3 mg/dl respectively, while those who underwent dialysis had higher urea (167 mg/dl) and creatinine (7.6mg/dl). Among the total, 13 (15%) cases received hemodialysis, out of which 10 cases (78 %) underwent intermittent hemodialysis and 3 cases (22 %) underwent sustained low efficiency dialysis, 44 (52%) cases had full recovery in renal function, 31 (37%) had partial recovery, 7 (8%) became dialysis dependent and 2 (3 %) cases expired (Figure 1).

DISCUSSION

AKI is a common complication with an incidence that has been increasing over time. A broad range of conditions can cause AKI including functional prerenal states, obstructive (post renal) and wide range of intrinsic renal disorders.

We conducted a hospital based, single center, prospective study to describe the characteristics and investigate clinical outcome of AKI patients of various etiologies. In our study the mean age of the studied patients was 48 ± 20 years (range 14-89 years). The average duration of presentation was 9 days.

In our study, nearly half of the patients of AKI were due to sepsis. Bagshaw *et al* showed that septic AKI is common cause compared to non septic.³ Neveu *et al* found that AKI had septic origin in 46% of patients.⁴ This is similar to our findings as nearly half of all patients had sepsis. In contrast, studies done by Khakurel *et al* and Chhetri *et al* found that gastroenteritis was leading cause of AKI followed by sepsis.^{5,6} The reason for findings of low representation of AKI due to gastroenteritis was

possibly attributed to selected referral from general medicine ward.

In our study, urogenital infections was the major cause of septic AKI followed by respiratory causes. In contrast to our study, Baghsaw and Ghimere *et al*, showed that respiratory causes was the primary source of septic AKI.^{3,7}

In our study, 7% patients had drug induced AKI. Non steroidal anti inflammatory drug was found to cause AKI in 3 patients, aminoglycosides in 2 patients and lithium in one patient. Patient with lithium toxicity was a case of bipolar disorder who presented with mid neurological manifestation. His lithium level was 4.5mg/dl. Though dialysis is indicated in lithium toxicity of more than 4 meq/L,⁸ our patient's renal function recovered fully with conservative treatment of intravenous fluids.

In our study, type 2 diabetes was the major comorbidity in AKI patients followed by hypertension. Tariq *et al* in their study found that ischemic heart disease and hypertension was the major comorbid conditions with diabetes being present in 17 % of the patients.⁹ AKI increases the risk of advanced chronic kidney disease in a diabetic patient independent of other major risk factors of kidney disease progression, and each episode of AKI doubles this risk.¹⁰

Currently, there is a wide variation worldwide regarding the indications and timing of initiation and discontinuation of renal replacement therapy for AKI.¹¹ The indications of hemodialysis in our patients were fluid overload, metabolic acidosis, hyperkalemia with electrocardiograph changes and uremic complications. Three patients who were hemodynamically unstable underwent sustained low efficiency dialysis (SLED). Two patients survived and one patient died. Numerous modalities of renal replacement therapy can be used in the treatment of patients with AKI. Hybrid modalities such as SLED is becoming popular in developing countries where continuous renal replacement therapy is unaffordable. SLED is a viable alternative to traditional continuous renal replacement therapies for critically ill patients in whom intermittent hemodialysis has failed or been withheld.^{12,13}

The natural history of AKI can have different fates. Patients who develop AKI may experience complete recovery of renal function, develop CKD, there may be exacerbation of the rate of progression of preexisting CKD or there can be irreversible loss of kidney function and evolution into end stage renal disease.¹⁴ In our study, more than half of the patients with AKI had favorable outcome with full recovery in almost half of the cases whereas 8 % patients became dialysis

dependent. Similar findings of renal recovery was seen in the study conducted by Khakurel *et al.*⁵ Three diabetic patients with AKI and 4 patients of cancer with AKI became dialysis dependent. Two patients succumbed to death. Among the patients who died, one had sepsis due to pneumonia and the other had sepsis due to urinary tract infection with diabetes mellitus being the comorbid condition in both patients. To conclude, our study showed that sepsis is a common cause of AKI. In hemodynamically unstable patients, hybrid modalities like SLED can be an alternative to continuous renal replacement therapy. Overall, favourable renal recovery was observed in two third of the patients.

Disclosure: None

Conflict of interest : None

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