Original Article

A Comparative Study Between Patients with Community Acquired Acute Kidney Injury and Hospital Acquired Acute Kidney Injury from A Tertiary Care Hospital In Eastern Nepal

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Keywords: *CA-AKI; Comparative study; HA-AKI; Outcomes*

Abstract

Background: Acute kidney injury is increasingly prevalent in both low and high income countries and is associated with increased morbidity and mortality. This study aims to compare the outcomes of community acquired AKI (CA-AKI) and hospital acquired AKI (HA-AKI) among patients admitted to the department of internal medicine, B.P.Koirala Institute Of Health Sciences (BPKIHS), Dharan.

Methods: The study was a hospital based prospective, observational study conducted in internal medicine ward of a tertiary care hospital. The study duration was one year, from November 2019 to October 2020. A total of 100 patients were enrolled out of which 50 were patients with CA-AKI and 50 were patients with HA-AKI. Demographic and serum creatinine at baseline, on the day of discharge or 7th day and after 3 months were collected using pre-designed questionnaire and recorded in a structured porforma. Patients were followed up at 3months after discharge to evaluate treatment outcome as recovery from AKI, chronic kidney disease (CKD), requirement for Renal Replacement Therapy and mortality in both groups.

Results: The mean age was 51.93±20.55 years with HA-AKI patients older than CA-AKI. Common co-morbidities were systemic hypertension(24% in CA-AKI and 34% in HA-AKI) followed by Diabetes mellitus(16% in CA-AKI and 28 in HA-AKI), CLD(6% in CA-AKI and 2% in HA-AKI), heart failure(6%in CA-AKI and 10% in HA-AKI).The mortality at 3 months was 20.00% in HA-AKI and 8.89% in CA-AKI. CKD was 8.88% in HA-AKI and 24.44% in CA-AKI. The need for hemodialysis was higher in CA-AKI patients than HA-AKI patients (14% vs. 2%; p=0.05). Most common cause of AKI in both the groups was infection. HA-AKI patients were found to have higher length of hospital stay than CA-AKI (8.5±6.8 days vs. 7.30±3.60 days; p=0.28) .

Conclusions: Patients with CA-AKI seem to have a higher requirement for renal replacement therapy. Mortality or incidence of CKD was similar in both the groups at 3 months. HA-AKI patients were found to have higher length of hospital stay than CA-AKI.

Introduction

Acute kidney injury (AKI) is increasingly prevalent in low and high income countries and is associated with severe morbidity and mortality. In a meta-analysis of 143 studies with more than3.5 million patients the global incidence of AKI was estimated to be 22 %, the equivalent of one in every five hospitalized patients[1]. There is no data regarding incidence of AKI in Nepal ,however studies for acute renal failure in a tertiary care centre in Nepal revealed glomerulonephritis/vacuitis, acute interstitial nephritis, hemolytic uremic syndrome, pre-renal azotemia as common causes of acute renal failure[2].

There are limited studies regarding the comparison between CA-AKI and HA-AKI from a low income country. Comparative studies regarding the outcome of community and hospital acquired AKI is lacking in our part of world. Our study could help to predict the etiology and outcomewhich could possibly help in the development of strategies to limit CA-AKI. Screening of high risk patients may have a significant impact on healthcare costs and patient's prognosis. Our study aims to compare the outcomes and clinical profile of community vs. hospital acquired acute kidney injury.

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Methods:

Our study is a hospital based prospective observational comparative study conducted from November 2019 to October 2020. The study was conducted in the internal medicine ward of department of Internal Medicine of B. P. Koirala Institute of Health Sciences (BPKIHS), Dharan. Ethical clearance was obtained from Institutional review committee (IRC) of BPKIHS before starting the study. Sampling was done with convenience sampling method. Written informed consent was taken from subjects.

Subjects meeting the case definition of AKI as per Kidney Disease Improving Global Outcomes (KDIGO) definition were enrolled in the study. Patients admitted to hospital with AKI apparent on their first serum creatinine (sCr) measured within 48 hours of admission to hospital were enrolled as having CA-AKI[3]. AKI that developed during the hospital stay with normal creatinine at admission were enrolled as having HA-AKI[3].

Patients under renal replacement therapy and who do not have access to mobile or telephone network were excluded from the study. A total of 100 patients were enrolled out of which 50 patients were each of CA-AKI and HA-AKI. Demographic and serum creatinine at baseline, on the day of discharge or 7th day and after 3 months were collected using pre-designed questionnaire and recorded in structured porforma. Patients were followed up at 3months after discharge to evaluate treatment outcome as recovery from AKIchronic kidney disease, requirement for RRT and mortality.

Data was entered in MS-EXCEL 2010. Descriptive statistics such as frequency, percentage, mean, standard deviation, median as required was calculated for quantitative variables. Categorical data were described using bar graphs. Chi-Square test was used to examine the association between nominal variables under study. Statistical analysis was performed with SPSS 20 and data was expressed as mean and standard deviation.

Results:

A total of 100 patients were enrolled in the study who were admitted in internal medicine ward at BPKIHS from November, 2019 to October 2020.50 patients were each of CA-AKI and 50 patients were of HA-AKI. The mean age of patients was 51.93±20.55 years, (table 1). As shown in the fig1, among the study population, 48% were male and 52% were female.

Table 1: Baseline Characteristics of the study Population (N=100)

Characteristics	Community acquired AKI (n=50) n (%)	Hospital acquired AKI (n =50) n (%)	P value
Age(years) Mini-max	48.80±19.85 98-17	55.06±20.16 19-93	0.12
Sex Male	20 (40)	28 (56)	0.10
Female	30 (60)	22 (44)	
Current smoker	9 (18)	13 (26)	0.33
Alcohol consumer	22(44)	14 (28)	0.06
Plus-minus values are mean±SD			

Among the co-morbidities, systemic hypertension(24% in CA-AKI and 34% in HA-AKI) followed by diabetes mellitus(16% in CA-AKI and 28 in HA-AKI) was the predominant co-morbidities in both the groups. More co-morbidities were present in HA-AKI patients than CA-AKI patients but the value is statistically not significant. Systemic hypertension was present in 24% of CA-AKI and 34 % of HA-AKI patients (p value: 0.27) followed by diabetes mellitus in 16% and 28% of CA-AKI and HA-AKI patients respectively (p value: 0.14). CLD was present in 6% of CA-AKI and 2 % of HA-AKI patients and heart failure in 6% of CA-AKI and 10% of HA-AKI patients respectively. Other co-morbidities were SLE, seizure disorder, stroke.(4% in CA-AKI and 8% in HA-AKI)

As shown in table no 2 regarding the cause of AKI; infection was seen in 62% of CA-AKI and 38% of HA-AKI and drug induced AKI was seen in 6 % of CA-AKI and 22% of HA-AKI.Other causes were hypovolemia, heart failure, renal parenchymal disease in both the groups.

Table 2: Comparison of potential cause of AKI in the study population

Characteristics	Community acquired AKI (n=50) n (%)	Hospital acquired AKI (n =50) n (%)	P value
Infection related	31(62)	19(38)	0.04
Hypovolemia	11 (22)	7 (14)	0.13
Heart failure	3 (6)	5 (10)	0.71
Drug induced	3 (6)	11 (22)	0.02
Renal parenchymal	2(4)	3 (6)	0.24
Not known	0	5 (10)	

Out of 100 patients with AKI, 10 patients were lost to follow up with 5 in each group. AKI recovery occurred in 70% of the patient, new onset CKD in 16.66%of patients and mortality was seen in 13.33% patients at 3 months follow up. As shown in table no 3; Out of 50 patients each in CA-AKI and HA-AKI, at 3 months follow up; 5 patients were lost to follow up in each group and AKI recovery occured in 66.67% and 71.11 %respectively (p value: 0.103), new onset CKD in 24.44% and 8.88% respectively (p value 0.073) and all-cause mortality at 3 months 8.89% and 20.00% respectively (p value 0.137) in CA-AKI and HA-AKI groups.

Table 3: Final Outcome of the study population at 3months

Characteristics	Community acquired AKI (n=45) n (%)	Hospital acquired AKI (n=45) n (%)	p value
AKI recovery	30(66.67)	32(71.11)	0.103
New onset CKD	11(24.44)	4 (8.88)	0.073
Mortality	4 (8.89)	9(20.00)	0.137

Regarding outcome of AKI in hospital, AKI recovered in 49%, persistent AKI in 48% and mortality in 3%. Out of 50 patients each of CA-AKI and HA-AKI, AKI recovered at discharge in 54% and 44% respectively (p-value: 0.479), persistent AKI in 46% and 50% respectively (p value 0.79) and mortality only in HA-AKI 6 % (p value: 0.079). Renal replacement therapy was required in 14% and 2% each in CA-AKI and HA-AKI (p value: 0.05) (table 7). Mean length of hospital stay was 7.51±5.47days among AKI patients. HA-AKI patients were found to have higher length of hospital stay than CA-AKI (8.5±6.8 days vs. 7.30±3.60 days) (p value:0.28).

AKI risk score was calculated among the study population and its relation with final outcome at 3 months was analyzed using chi-square analysis. Patients with low risk AKI score (<10) were more likely to recover from AKI than with high risk AKI score (≥10). Only 2 % of patients with low risk AKI score developed new onset CKD and 2% had mortality in contrast to high risk AKI score patients in which 15% developed new onset CKD and 11% had mortality at 3 months.

Discussion

Incidence and associated mortality risks of AKI in critically ill patients are well documented[4].Increase in serum creatinine levels in non-critically ill hospitalized patients are also common and carry heightened mortality[5].This has been attributed to older age and increased number of co-morbid conditions present in hospitalized patients with AKI. In contrast, studies describing risk factors, epidemiology and outcomes of patients who sustain AKI in the community are limited and there are no studies in our part of world that compare CA-AKI with those of HA-AKI.

In the present study, 100 patients 50 each of CA-AKI and HA-AKI were studied for 3 months and their outcomes and clinical profile were compared.

This study highlights that mean age of patient was 51.93±20.55 years with HA-AKI patients older than CA-AKI patients which is in agreement with previous studies of wannacott et al.[3] but patients in that study were older with mean age of 74.4±15.4 years in CA-AKI and 76.8±13 years in HA-AKI .

Risk factors for CA-AKI and HA-AKI were similar with hypertension, diabetes, heart disease being the common ones. More co-morbidities were present in HA-AKI patients but were statistically not significant. This highlights the clinical characteristics of people in the community who may benefit from more frequent blood tests in the event of an acute illness or medication change and early recognition, management and referral if indicated. This is in agreement with previous studies that diabetes, hypertension and heart failure are important risk factor for AKI. Most common cause of AKI in both groups was infection. However, hypovolemia in CA-AKI and drug induced in HA-AKI are 2nd most common cause. Previous studies by wonnacott et al[3] and Bardai G El et al[6] also support that dehydration/hypovolemia as important cause of CA-AKI and drug induced as important cause of HA-AKI.

The need for acute dialysis in patients with AKI ranges from 36% to 86 %,[7] depending on the origin of the AKI and the hospital setting. A rate of 36% was reported in one community based study[7] while the rate was 46% to 86% in a hospital-based ICU study. In our study we observed the need for acute dialysis was higher in CA-AKI patients than HA-AKI patients (14% vs. 2%; p=0.05). This may be due to less severe AKI patients of HA-AKI due to early detection with early implementation of STOP AKI protocol.

Previous studies report increased length of stay, increased likelihood of discharge to rehabilitation facility, and increased mortality in patients with HA-AKI[5, 8] In our study, the length of hospital stay was not different between patients with CA-AKI and HA-AKI and the degree of renal dysfunction could not predict the length of hospital stay alone in the both groups.

All notable adverse outcomes in AKI such as mortality occurred more frequently in HA-AKI. This might be due to high proportion of older adults in the study population and also more co-morbidities in HA-AKI leading to increased mortality. However, exact cause for this difference in mortality could not be defined. It has been previously noted that mortality in CA-AKI may be upto 20% lower than that of HA-AKI[7]. According to recent reports, the mortality rate in CA-AKI ranged from 15% to 26%[5] whereas the mortality rate in HA-AKI ranged from 25% to 70 %[14]. Even mild AKI is no longer considered to be benign, but rather an independent predictor of mortality[5]. Documented predictors of mortality such as oliguria, sepsis, multi organ failure, and ICU stay or mechanical ventilation occurred more frequently in patients with HA-AKI[9].

Our study contrasts to the previous studies of Ghita El Bardai et al[6] and wonnacott et al(3)which shows high mortality of 45% in CA-AKI and 62.9% in HA-AKI, with similar rates of new onset CKD. This difference might be due to patients with less severe AKI were enrolled in our study and also the outcome of patient with loss to follow up was not known who could have adverse outcome including mortality. Similarly, mortality of CA-AKI was 12% in a study by ..et al andmortality of 37.2% inHA-AKI in a study by Singh TB et al[11]. However, patients from surgical ward and even intensive care unit were included in that study in contrast to our study.

In the "recognition and management of CA-AKI in low resource setting in the ISN 0by25trial", mortality of CA-AKI was 13% and increase from 7% at 7days to 10% at 1month and 12% at 3 months[12]. Patient with more severe AKI had significantly higher mortality than stage I AKI or no AKI. Mortality in dialyzed patient was 29%. Mortality of HA-AKI was found to be higher than CA-AKI patients which could be due to older population and more co-morbidities than CA-AKI patients though statistically insignificant.

Patients with CAAKI had more severe AKI, shorter hospitalizations, yet better long-term survival than patients with HAAKI. Superior survival in CA-AKI was surprising because these patients had co morbid conditions similar to those of patients with HA-AKI. The reasons for these differences remain unclear. Interestingly, a study performed in Scotland demonstrated that inadequacies in recognition and management of hospital based AKI were particularly high in patients with mild AKI[13]. Perhaps further contributing to differences in management of CA-AKI and HA-AKI is that on admission to the hospital patients are generally assessed thoroughly and all laboratory investigation are done within 6 to 24 hours. However, after this, further management is dependent on symptoms of patients with investigations only done when needed, so oliguric AKI is missed in hospitalized patients in absence of symptoms as it is well known that uremic symptoms develop very late in course, so only those patients are picked early who develop reduced urine output. This may also underlie differences in early appropriate recognition and management of CA-AKI and HA-AKI, which may ultimately influence differences in outcomes.

Our data suggests that CA-AKI is a common cause of AKI that is as severe as that seen in HA-AKI. AKI has a significant impact on length of stay, mortality, and the development of CKD. Development of strategies to limit the risk of CA-AKI such as high risk factor

subject screening may have a significant impact on healthcare costs and patient's prognosis.

Despite this, patients with CA-AKI have better short and long-term outcomes, the reasons for which are unknown. The reason may be the difference in etiology and access to care as well as STOP Protocol. In these low-resource settings, acute kidney dysfunction is seldom recognized, due to inaccessibility of diagnostic tools, limited access to healthcare, and a lack of awareness of the impact of kidney dysfunction on patient outcomes. Delays in recognizing AKI are common and have been associated with a 30% higher risk of mortality in hospitalized patients[13]. So, timely recognition and intervention are a significant component of managing patients with kidney and can lead to better outcome. There are limitations of the study . Patients of only medical wards were enrolled rather than patients in surgical and intensive care unit which could have different outcomes. Combined pattern of cause of AKI in the study population was not seen and only potential cause of AKI was looked after. Longer duration of follow up could not be done beyond 3 months. So long term renal outcome could not be assessed. Our study concluded that patients with CA-AKI required more renal replacement therapy but mortality or rate of new onset CKD was similar in both CA-AKI and HA-AKI patients at 3 months.

Conclusion

The study showed that patients with CA-AKI required more renal replacement therapy but mortality or rate of new onset CKD was similar in both CA-AKI and HA-AKI patients at 3 months. Risk factors were similar between two groups of population with hypertension, diabetes, heart failure being common ones. HA-AKI patients were found to have higher length of hospital stay than CA-AKI

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Conflict of Interest: None

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