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Prevalence of risk factors of acute kidney injury in a tertiary care hospital in Pakistan

Ainan Arshad¹, Ahmed Ayaz²

Abstract

The objective of this study was to determine the prevalence of preventable risk factors of acute kidney injury in a tertiary care hospital in Pakistan. All patients admitted at Aga Khan University Hospital, Karachi with diagnosis of acute kidney injury were included out of which 134 were selected via random sampling. Patients with existing CKD were excluded. Data was then collected retrospectively from medical records of these patients. Mean age was 60±11.7 years while mean serum creatinine on admission was 2.4±1.3 (mg/dl). Sepsis played a role in almost half of the patients [60 (45%)]. Other factors included diarrhoea [23 (17%)], nephrotoxic drug use [25 (19%)] and cardiac pathology [24 (18%)]. It was found that most cases of AKI were due to preventable factors (infections, diarrhoea, and drug toxicity) and concerted efforts to eliminate them would be vital in reducing mortality caused by AKI in developing countries.

Keywords: Acute kidney injury, acute renal failure, sepsis
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Introduction

Acute kidney injury is a serious health concern affecting 13.3 million people globally and causing more than 2 million deaths annually.¹ It has wreaked havoc in patients of all ages around the world as it is independently associated with a poor quality of life and increased risk of mortality. Recent studies have reported alarming figures with incidence as high as 22% of all hospital admissions and mortality rates above 50% in severely affected patients.² The International Society of Nephrology (ISN) has addressed this predicament by launching the 0 by 25 initiative which aims to eliminate preventable deaths caused by acute kidney injury in developing countries by the year 2025.² It intends to achieve this massive feat by introducing policies to timely identify and treat potentially reversible causes of AKI in these countries. Sadly, this campaign can only reach its full potential when comprehensive data from these regions is available

regarding AKI and its risk factors. Some studies have been done in these regions but to our knowledge, none of them used the international KDIGO criteria as per ISN's indications. This study could serve as a platform for larger scale nation-wide studies in Pakistan to tackle this serious issue and help avert millions of needless deaths in Pakistan on a country level.

Patients, methods and results

This was a single center, retrospective study conducted at Aga Khan University Hospital, Karachi. The study was approved by the Ethics and Review Committee of Aga Khan University. All adult patients admitted at Aga Khan University Hospital, Karachi with diagnosis of acute kidney injury during the period January-December 2017 were included, out of which 134 were selected via random sampling. Patients with existing CKD were excluded. Data was then collected retrospectively from medical records of these patients with recorded variables including demographic data (age and sex), medical history, comorbid conditions, use of nephrotoxic drugs, creatinine at baseline and on admission, urine output, diarrhoea, sepsis, circulatory shock, burns, trauma, diabetes mellitus, hypertension, coronary artery disease, congestive heart failure, neoplasms and HIV infections. The baseline creatinine considered was the last stable measurement in the patient's clinical history prior to admission or, considering that some individuals had no recent or previous creatinine values, the lowest creatinine value within the next 28 days after AKI.

AKI and CKD were diagnosed and classified according to the KDIGO criteria.^{3,4} Nephrotoxic drugs [non-steroidal anti-inflammatory drugs (NSAIDs), Antibiotics, angiotensin-receptor blockers (ARBs), angiotensin-converting enzyme inhibitors (ACEIs) and diuretics] were considered the cause of renal failure if a patient had received any of them for a minimum of 3 days prior to the defined increase in serum creatinine concentration. Sepsis was defined by SCCM (Sepsis 1) by the presence of any two or more of the following: Positive blood culture, fever more than 100°F (37.5°C), White cell count > 10×10⁹ /L, Heart rate >90 beats per minute, Respiratory rate > 20 breaths/min,

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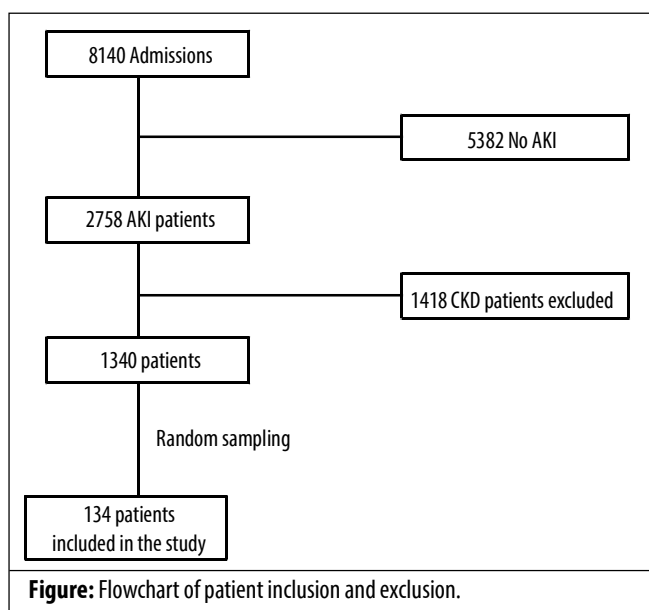
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Hypotension MAP < 70 mmHg, Altered mental status with GCS <12.⁵

During this period 8140 patients were admitted in the department of medicine, out of which 2758 patients were diagnosed with AKI, 1418 were excluded due to CKD. Out of the remaining patients, 134 patients were then selected via random sampling for detailed review of risk factors. (figure). There were 74 males and 60 females with a mean age of 60±11.7 years. Baseline characteristics, distribution of KDIGO staging and prevalence of risk factors are shown in Table. Incidence of AKI was 34% of all hospital admissions. Baseline renal function was known in 127 (95%) patients with mean creatinine value of 0.90 mg/dl ± 0.18. In 7 (5%) patients baseline renal function was not available. Sepsis played a role in almost half of the patients [60 (45%)]. Culture negative sepsis was found in 25 (42%)

Table: Baseline characteristics of patients and prevalence of risk factors of AKI.

CHARACTERISTICS	n (%)
Age range (years)	60 ± 11.7
18-30	4 (3%)
31-40	9 (7%)
41-50	7 (5%)
51-60	34 (25%)
61-70	68 (50%)
71-80	10 (8%)
> 80	2 (2%)
Gender	
Male	74 (55.2%)
Female	60 (44.8%)
Diabetes	65 (48.5%)
Hypertension	91 (67.9%)
Smokers	18 (13.4%)
Ischaemic heart disease	48 (35.8%)
Baseline renal function	
Mean serum creatinine (mg/dl)	0.90 ± 0.18 (Normal range: 0.6-1.2 mg/dl)
Admission renal function	
Mean serum creatinine (mg/dl)	2.4 ± 1.3
KDIGO STAGE	
Stage 1	44%
Stage 2	31%
Stage 3	25%
RISK FACTORS	n (%)
Sepsis	60 (45%)
Gram positive organisms	6 (10%)
Gram negative organisms	23 (38%)
Culture negative	25 (42%)
Culture not done	6 (10%)
Diarrhoea	23 (17%)
Cardiovascular event	24 (18%)
Nephrotoxicity	25 (19%)
NSAIDs	6 (24%)
ACEI/ARBs	7 (28%)
Antibiotics	4 (16%)
Diuretics	8 (32%)
Traumatic injury/RTA	6 (4.5%)
Burns	1 (0.7%)



patients and 23 (38%) patients were infected by gram negative organisms out of which E. Coli was the leading organism. Gram positives were responsible for 10% of the infections. Other factors leading to AKI included diarrhoea in [23 (17%)], nephrotoxic drug use in 25 (19%) and cardiac pathology in 24 (18%). The most common age group for all these above pathologies was 61-70 years. Hydronephrosis was not a contributing factor in any of the cases.

Discussion

AKI in sepsis is significantly associated with a poor prognosis and a higher risk of ICU and hospital mortality.^{6,7} The growing population of patients that develop AKI due to sepsis, along with the associated ominous prognosis highlight the need for timely management of infections and continuous monitoring of renal function in sepsis in developing countries. Timely diagnosis, prompt haemodialysis, and sufficient supportive therapy have proved to be highly effective in minimizing infectious disease-associated AKI and improving patient outcomes.⁸ Thus, the early diagnosis of AKI and prompt management of infections are a key step forward in the struggle to minimize deaths by this disease.

Diarrhoea was another risk factor of AKI with a prevalence of 23%. This is easily the most preventable cause of AKI anywhere in the world. Prevention starts at the primary care level with timely assessment of patients at risk and adequate rehydration to prevent hypovolaemia. If not

addressed on time, the consequences tend to be severe. Bradshaw and colleagues, in their national level study in the US, reported that AKI complicates diarrhoeal illness in 1 in 10 patients and is significantly associated with a 5 times increase in mortality.⁹ In addition to this, diarrhoea is already rampant in these parts of the world with biological contamination of drinking water being a major contributor. Appropriate hygiene and cost-effective water filter techniques can play a major role in reducing the spread of diarrhoea and its complications.

Judicious use of nephrotoxic drugs is another worrying yet easily avoidable risk factor of AKI. Our study reported that 19% of all AKI patients were found to be using nephrotoxic drugs prior to admission. The most common agents in our study were NSAIDs (24%), ACEI/ARBs (28%), antibiotics (16%) and diuretics (32%). Many elderly patients present with multiple comorbid conditions for which they are usually receiving treatment regimens. They often consult multiple physicians of different specialties for their illnesses, which often leads to infrequent or minimal data sharing between healthcare providers and different clinical settings. Without a unified medical record database, this can lead to overdosing of medications. Another problem in developing countries is the relatively relaxed approach towards prescriptive medications as they are easily obtainable at any common drugstore. Furthermore, pharmacists are rarely recruited at most drug stores, leading to unqualified people selling medications with little knowledge of indications, side effects or drug interactions of different drugs. The best method to minimize this major risk factor is to get thoroughly acquainted with medications that routinely cause nephrotoxicity and to only prescribe such medications after careful evaluation of the patient's comorbid conditions and risk status. Of the 24 (18%) patients that had cardiovascular events, acute MI was the cause in 14 patients and congestive heart failure in 10 patients. Deaths associated with AKI is a global health concern, but most preventable deaths occur in low income countries which consist of 85% of the universal population.¹⁰

Conclusion

The results of this study have proved that the majority of risk factors of AKI are preventable (infections, diarrhoea and drug toxicity) and can be easily eliminated by interventions at the primary level if managed on time. These efforts would go a long way in reducing mortality caused by AKI. Hence, we hope this study becomes the basis for further large-scale studies in Pakistan where AKI continues to wreak havoc and take millions of needless lives.

Ethical Review: The study was approved by the Ethical Review Board of Aga Khan University.

Disclaimer: None.

Conflict of interest: None.

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