

**Spectrum of Community-Acquired Acute Kidney Injury at Patna Medical College and Hospital, Patna: A Prospective Observational Study****Papu Kumar Safi<sup>1</sup>, Sumbul Kazmi<sup>2</sup>, Santosh Kumar<sup>3</sup>, Vijay Achari<sup>4</sup>**<sup>1</sup>Senior Resident, Department of Endocrinology, Patna Medical College & Hospital Patna, Bihar, India<sup>2</sup>Senior Resident, Department of Emergency Medicine, Patna Medical College & Hospital Patna, Bihar, India<sup>3</sup>Senior Resident, Department of Medicine, Patna Medical College & Hospital Patna, Bihar, India<sup>4</sup>Professor, Department of Medicine, Patna Medical College & Hospital Patna, Bihar, India

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**Abstract****Background:** In underdeveloped nations, community-acquired acute kidney injury (CA-AKI) continues to be a serious public health issue that greatly increases morbidity, mortality, and the cost of healthcare. Due to variations in socioeconomic circumstances, environmental exposures, infectious illnesses, and availability to early medical care, the etiological profile of CA-AKI differs greatly between areas. There is little information from eastern India, especially Bihar.**Objectives:** To assess community-acquired acute kidney damage in patients admitted to a tertiary care facility in eastern India in terms of demographics, clinical spectrum, etiological variables, severity, and short-term outcomes.**Methods:** From February to September of 2025, this prospective observational study was carried out at Patna Medical College and Hospital. Kidney Disease: Improving Global Outcomes (KDIGO) criteria were used to diagnose 110 adult patients with community-acquired AKI. AKI staging, comorbidities, clinical presentations, laboratory parameters, etiological variables, requirement for renal replacement treatment, and in-hospital outcomes were all methodically documented and examined.**Results:** Patients were mostly male, with a mean age of roughly middle adulthood. The most frequent causes were exposure to toxins, volume deprivation, and infectious causes. Due to a delay in obtaining medical attention, a sizable percentage of patients had advanced stages of AKI. A proportion of patients needed renal replacement therapy, and overall results varied according to the cause and severity at presentation.**Conclusion:** In this area, community-acquired AKI is mostly avoidable and frequently manifests at an advanced stage. Early detection, timely treatment of infections and dehydration, and raising awareness at the community level could significantly lower the burden of disease and enhance results.**Keywords:** Community-acquired acute kidney injury; CA-AKI; Prospective study; Etiology; Tertiary care hospital; Eastern India.

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**Introduction**

Acute kidney injury (AKI) is a prevalent and dangerous clinical illness marked by an abrupt deterioration in renal function that impairs fluid, electrolyte, and acid-base balance management. It is linked to significant short- and long-term negative consequences, such as longer hospital stays, the development of chronic kidney disease (CKD), and higher mortality [1,2]. Although AKI occurs in all healthcare settings, the epidemiology of the condition varies significantly across high-income and low- to middle-income nations. AKI that is present at the time of hospital admission or develops within 48 hours of admission is referred to as community-acquired acute kidney damage

(CA-AKI), which reflects insults that take place outside of the hospital setting [3]. CA-AKI is frequently associated with drug-related nephrotoxicity, hemodynamic instability, and older populations with various comorbidities in industrialized countries [4]. On the other hand, CA-AKI frequently affects younger people in poor nations like India and is mostly caused by avoidable factors such as infections, dehydration, diarrheal diseases, sepsis, envenomation, and exposure to nephrotoxic chemicals [5,6]. Due to its vast population, uneven access to healthcare, high incidence of infectious infections, and extensive use of over-the-counter drugs and traditional

medicines, India is disproportionately affected by CA-AKI [7]. The issue is made worse by seasonal fluctuations, inadequate sanitation, contaminated drinking water, and delayed tertiary care referrals [8]. The etiological spectrum of CA-AKI has shown significant variation in studies from various parts of India, highlighting the significance of region-specific data for successful prevention and management efforts [9,10].

Despite this, there is still a dearth of information about CA-AKI from eastern India, especially Bihar. The pattern and results of CA-AKI may be influenced by Bihar's dense population, predominately rural residency, lower socioeconomic indicators, and restricted access to early medical care. For the purpose of early diagnosis, risk assessment, and the development of focused public health interventions, it is essential to comprehend the local spectrum of disease.

Additionally, many patients with CA-AKI appear in severe stages of renal failure, frequently requiring renal replacement therapy, making delayed presentation a significant problem in settings with limited resources [11]. Patient outcomes can be greatly enhanced and healthcare expenditures can be decreased by early detection of high-risk etiologies and clinical predictors of severity [12]. In order to assess the demographic profile, clinical presentation, etiological variables, severity, and short-term outcomes of community-acquired acute kidney injury, the current prospective observational study was conducted at Patna Medical College and Hospital in Patna.

This project is to improve knowledge of CA-AKI in eastern India and aid in the creation of preventive and treatment approaches suited to regional need by producing region-specific data.

### Aim & Objectives

**Aim:** To investigate the range of acute renal injury acquired in the community among patients admitted to Patna Medical College and Hospital.

### Objectives:

1. To assess the demographic and clinical profile of patients with community-acquired acute kidney injury.
2. To identify the etiological factors contributing to community-acquired acute kidney injury.
3. To determine the severity of acute kidney injury based on KDIGO staging at presentation.
4. To evaluate short-term in-hospital outcomes, including the need for renal replacement therapy and recovery status.

### Materials & Methods

**Study Design and Setting:** The Department of Medicine at Patna Medical College and Hospital, a significant tertiary care referral hospital serving

both urban and rural populations in eastern India, was the site of this prospective observational study.

**Study Duration:** The study was conducted from February 2025 to September 2025, a span of eight months.

**Study Population and Sample Size:** Over the course of the trial, 110 adult patients with a diagnosis of community-acquired acute kidney injury (CA-AKI) were sequentially enrolled. Every qualified patient who came to the medical wards or emergency room was screened for inclusion.

### Inclusion Criteria

- Age  $\geq 18$  years
- Diagnosis of acute kidney injury at the time of admission or within 48 hours of hospital admission
- AKI defined according to Kidney Disease: Improving Global Outcomes (KDIGO) criteria, based on serum creatinine values and/or urine output
- AKI attributable to causes originating in the community

### Exclusion Criteria

- Known cases of chronic kidney disease (documented CKD or ultrasound evidence of chronicity)
- Hospital-acquired AKI
- Renal transplant recipients
- Patients with obstructive uropathy due to known malignancy
- Patients unwilling to provide informed consent

**Data Collection:** A standardized proforma was used to gather comprehensive clinical data after informed consent was obtained. Demographic information (age, sex, place of residence), presenting symptoms, length of illness, concomitant diseases, history of drug use (including indigenous medicines and nephrotoxic medications), and potential exposure to toxins or infections were all noted. At admission, a comprehensive clinical examination was carried out, with a focus on systemic involvement, hemodynamic stability, and volume status. Complete blood counts, serum urea and creatinine, serum electrolytes, liver function tests, blood glucose, urine routine and microscopy, and pertinent serological assays as indicated were all part of the laboratory studies. All patients had abdominal ultrasonography to measure kidney size and rule out blockage or chronic kidney disease.

**Etiological Classification:** CA-AKI was divided into prerenal, intrinsic renal, and postrenal causes based on clinical evaluation and investigation results. Wherever possible, reasons such as envenomation, drug-induced nephrotoxicity, infectious etiologies, and volume depletion were found.

**Severity Assessment:** Serum creatinine criteria were used to classify the severity of AKI into KDIGO stages 1, 2, and 3. When accurate measurements were available, urine output criteria were used.

**Outcome Measures:** Renal function recovery, the need for renal replacement treatment, and in-hospital mortality were the main outcomes. At discharge, renal recovery was classified as either partial (improvement without normalization) or complete (return of serum creatinine to baseline or near-baseline levels).

**Ethical Considerations:** The Institutional Ethics Committee gave their approval to the study protocol. Every procedure was carried out in compliance with the Declaration of Helsinki's tenets and ethical norms. Every participant or their legally designated representative provided written informed consent.

**Statistical Analysis:** The relevant statistical software was used to examine the data once it was entered into a spreadsheet. Categorical data were

expressed as frequencies and percentages, whilst continuous variables were expressed as mean  $\pm$  standard deviation or median with interquartile range. Using appropriate statistical tests, relationships between etiological variables, AKI severity, and outcomes were evaluated; a p-value of less than 0.05 was deemed statistically significant.

### Results

The final study comprised 110 individuals with community-acquired acute kidney damage (CA-AKI). The findings are displayed under the following categories: management, short-term outcomes, etiological spectrum, clinical presentation, severity of AKI, and demographics.

**Baseline Demographic and Clinical Characteristics:** The majority of the patients in the study were middle-aged or older, despite the study population's broad age diversity. Males were more frequently impacted than females. Most of the patients arrived late in their illness and came from rural locations.

**Table 1: Baseline demographic and clinical characteristics of study population (n = 110)**

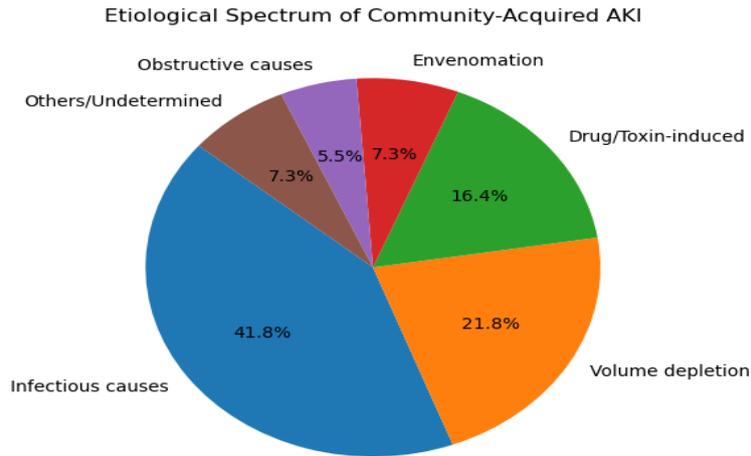
Variable	Number (%)
<b>Age group (years)</b>	
18–40	28 (25.5)
41–60	46 (41.8)
>60	36 (32.7)
<b>Sex</b>	
Male	72 (65.5)
Female	38 (34.5)
<b>Residence</b>	
Rural	74 (67.3)
Urban	36 (32.7)
<b>Common presenting symptoms</b>	
Oliguria/anuria	68 (61.8)
Fever	56 (50.9)
Vomiting/diarrhea	44 (40.0)
Edema	38 (34.5)
Altered sensorium	22 (20.0)

**Etiological Spectrum of CA-AKI:** Volume depletion, drug/toxin-related reasons, and infectious causes were the most frequent causes of CA-AKI. Tropical infections, severe gastroenteritis, and sepsis of unknown cause were common causes of infections.

**Table 2: Etiological distribution of community-acquired AKI**

Etiology	Number (%)
<b>Infectious causes</b>	46 (41.8)
– Sepsis (undifferentiated)	20 (18.2)
– Acute gastroenteritis	14 (12.7)
– Tropical infections*	12 (10.9)
<b>Volume depletion (non-infectious)</b>	24 (21.8)
<b>Drug/toxin-induced</b>	18 (16.4)
– NSAIDs / nephrotoxic drugs	10 (9.1)
– Indigenous/herbal medications	8 (7.3)
<b>Envenomation</b>	8 (7.3)
<b>Obstructive causes</b>	6 (5.5)
<b>Others / undetermined</b>	8 (7.3)

\*Includes malaria, dengue, leptospirosis, and scrub typhus

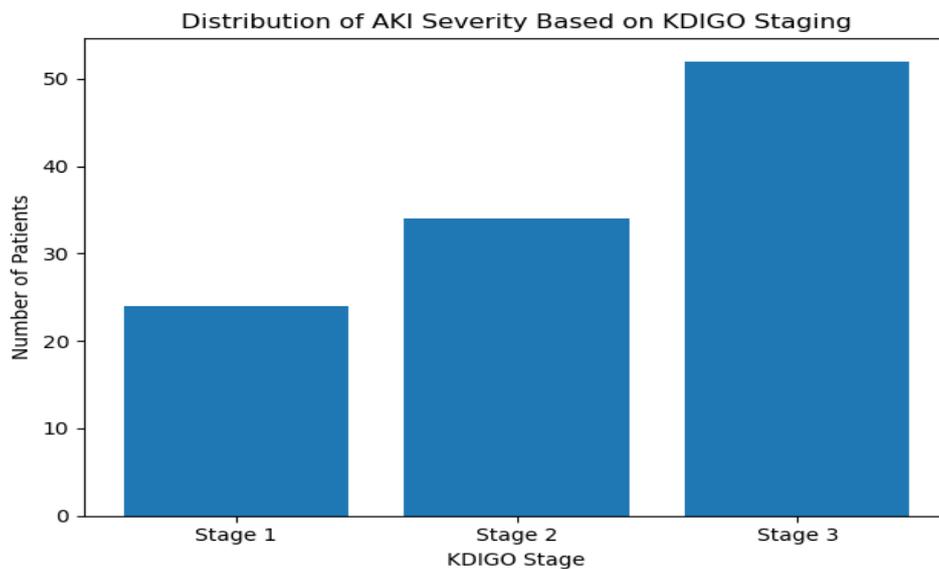


**Figure 1: Etiological distribution of community-acquired acute kidney injury among the study population.**

**Severity of Acute Kidney Injury:** The majority of patients had advanced AKI when they first arrived. The most prevalent stage upon admission was KDIGO stage 3, which denotes delayed presentation and referral.

**Table 3: Distribution of AKI severity based on KDIGO staging**

KDIGO Stage	Number (%)
Stage 1	24 (21.8)
Stage 2	34 (30.9)
Stage 3	52 (47.3)

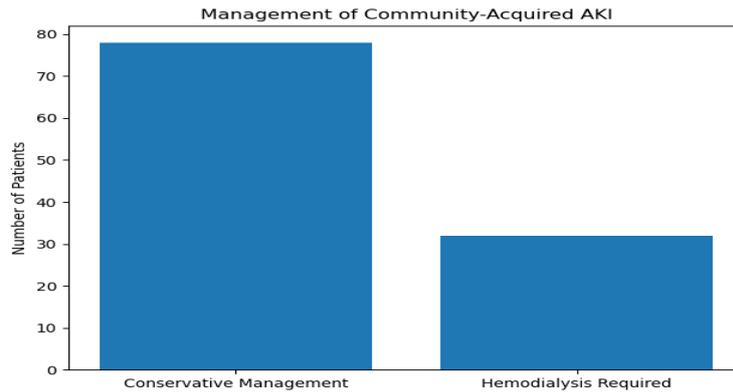


**Figure 2: Distribution of patients with community-acquired acute kidney injury according to KDIGO staging at presentation.**

**Management and Renal Replacement Therapy:** For most patients, conservative treatment that included hydration optimization, infection control, and avoidance of nephrotoxins was enough. However, a sizable group, primarily those with KDIGO stage 3 AKI, needed renal replacement treatment.

**Table 4: Management strategies and need for renal replacement therapy**

Parameter	Number (%)
Conservative management only	78 (70.9)
Hemodialysis required	32 (29.1)
– Single session	12 (10.9)
– Multiple sessions	20 (18.2)

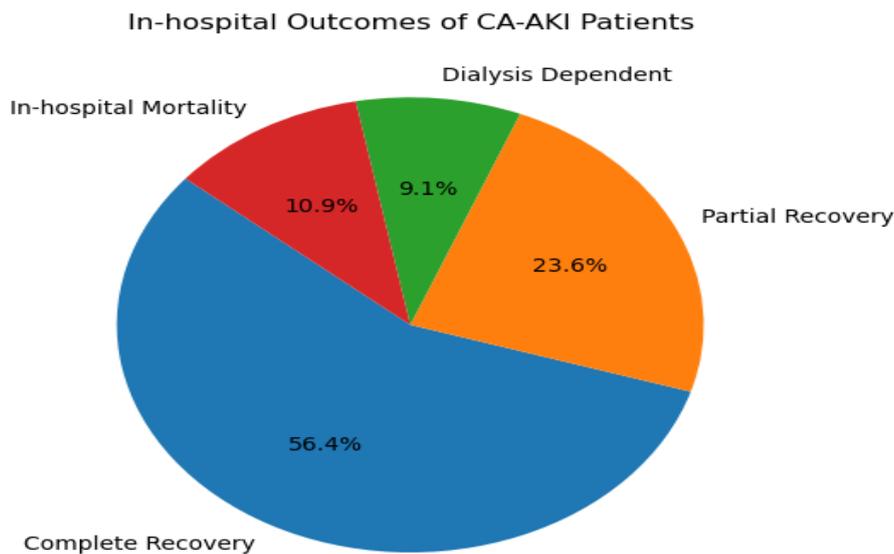


**Figure 3: Management pattern of community-acquired acute kidney injury showing the proportion of patients requiring hemodialysis.**

**Short-Term Outcomes:** Over half of the patients had fully recovered their renal function at the time of discharge. A considerable percentage of patients showed partial recovery, although in-hospital mortality persisted, especially among those with advanced-stage and infection-related AKI.

**Table 5: In-hospital outcomes of patients with CA-AKI**

Outcome	Number (%)
Complete recovery	62 (56.4)
Partial recovery	26 (23.6)
Dialysis-dependent at discharge	10 (9.1)
In-hospital mortality	12 (10.9)



**Figure 4: Short-term in-hospital outcomes of patients with community-acquired acute kidney injury.**

**Discussion**

A thorough picture of the range of community-acquired acute kidney injury (CA-AKI) among patients referred to a tertiary care facility in eastern India is given by this prospective observational study. The results show that early detection and prompt referral are still lacking in settings with low resources, as evidenced by the prevalence of avoidable etiologies, late presentation, and considerable disease severity upon admission.

The current study's demographic profile revealed a larger percentage of male patients and a preponderance of middle-aged and older patients. Male preponderance has been linked to increased occupational exposure, higher healthcare-seeking behavior among males, and increased exposure to infections and nephrotoxic chemicals in earlier Indian and worldwide investigations [13, 14]. This cohort's preponderance of rural patients highlights the impact of socioeconomic constraints, restricted

access to primary healthcare, and delayed referral on disease burden and outcomes [15].

More than two-fifths of CA-AKI cases were shown to be caused by infectious etiologies. Major contributing factors were sepsis, severe gastroenteritis, and tropical illnesses including dengue and malaria. In contrast to affluent nations where drug-induced and comorbidity-associated AKI predominate, this pattern is similar with studies from other regions of India and South Asia, where infection-related AKI continues to be a significant cause [16,17]. The current study's high rate of infection-related AKI emphasizes the ongoing effects of inadequate sanitation, contaminated drinking water, and postponing the treatment of feverish conditions.

The second most frequent etiological factor was volume depletion, both infected and non-infectious. In tropical areas, dehydration from vomiting, diarrhea, and inadequate oral intake is still a major but mostly avoidable cause of CA-AKI [18]. The frequency and severity of AKI in these patients could be significantly decreased by early fluid resuscitation at the community level.

Non-steroidal anti-inflammatory pharmaceuticals and traditional or herbal remedies were often linked to drug- and toxin-induced AKI, which accounted for a significant percentage of patients. The extensive use of complementary therapies and uncontrolled access to over-the-counter drugs have been repeatedly identified as significant causes of CA-AKI in India [19]. This result emphasizes the necessity of raising public knowledge and enforcing more stringent laws pertaining to the use of potentially nephrotoxic substances.

The large percentage of patients who presented with KDIGO stage 3 AKI was a significant finding in this study. Similar to reports from other tertiary care facilities in underdeveloped nations, about half of the patients had advanced renal failure at admission [20]. Delays in identifying symptoms, unskilled practitioners treating patients at first, and referrals made only after serious decline can all be contributing factors to late presentation. Poorer outcomes and the requirement for renal replacement therapy were also closely linked to advanced-stage AKI.

Hemodialysis was necessary for almost one-third of patients, mostly those with severe AKI and infection-related etiologies. The percentage of Indians in need of dialysis is similar to that found in other Indian research, although it is still significantly greater than that found in high-income nations [21]. Due to the scarcity of dialysis facilities in peripheral locations, beginning is frequently delayed, which may have a negative impact on survival and recovery.

More than half of the patients in this trial had fully recovered renal function by the time of release, despite the severity at presentation. This positive result highlights the possibility of reversing CA-AKI with prompt and suitable care [22]. However, a sizable percentage either only partially recovered or continued to require dialysis, putting them at higher risk of developing chronic renal disease. The prognostic significance of early diagnosis and care is reinforced by the fact that in-hospital mortality was higher among patients with sepsis-related AKI and advanced KDIGO stages, while being equivalent to similar studies [23, 24].

Overall, the study's results support the idea that CA-AKI in developing nations is mostly avoidable and perhaps reversible. Reducing the incidence of CA-AKI requires strengthening primary healthcare services, enhancing early diagnosis of high-risk individuals, managing infections and dehydration promptly, and raising public knowledge about nephrotoxic drugs [25].

### Conclusion

In the population that Patna Medical College and Hospital serves, community-acquired acute kidney damage continues to be a major and mostly avoidable cause of morbidity. This prospective observational study shows that CA-AKI primarily affects middle-aged and older people in this region, with a larger burden among males and rural dwellers. The main reasons, which reflect underlying socioeconomic and healthcare access issues, are infectious etiologies, volume depletion, and exposure to nephrotoxic pharmaceuticals or indigenous treatments.

A significant percentage of patients had advanced stages of AKI, underscoring community-level delays in diagnosis and referral. The necessity for renal replacement treatment and the observed mortality highlight the clinical severity of CA-AKI at presentation, even though more than half of the patients recovered completely with proper hospital-based care. These results highlight the significance of early diagnosis, timely treatment of infections and dehydration, prudent medication usage, and enhanced referral mechanisms.

To lower the prevalence and enhance the results of community-acquired acute kidney injury in this area, targeted public health initiatives, improved primary healthcare services, and community education about early signs of kidney injury and avoiding nephrotoxic agents are crucial. To assess the development of chronic kidney disease and to guide region-specific preventative measures, more multicentric studies with long-term follow-up are necessary.

## References

1. Kellum JA, Lameire N, Aspelin P, Barsoum RS, Burdmann EA, Goldstein SL, Herzog CA, Joannidis M, Kribben A, Levey AS. Work group membership. *Kidney Int.* 2012;2(1):10-38.
2. Hoste EA, Kellum JA, Selby NM, Zarbock A, Palevsky PM, Bagshaw SM, Goldstein SL, Cerdá J, Chawla LS. Global epidemiology and outcomes of acute kidney injury. *Nature Reviews Nephrology.* 2018 Oct;14(10):607-25.
3. Wonnacott A, Meran S, Amphlett B, Talabani B, Phillips A. Epidemiology and outcomes in community-acquired versus hospital-acquired AKI. *Clinical Journal of the American Society of Nephrology.* 2014 Jun 1;9(6):1007-14.
4. Coca SG, Singanamala S, Parikh CR. Chronic kidney disease after acute kidney injury: a systematic review and meta-analysis. *Kidney international.* 2012 Mar 1;81(5):442-8.
5. Mehta RL, Burdmann EA, Cerdá J, Feehally J, Finkelstein F, García-García G, Godin M, Jha V, Lameire NH, Levin NW, Lewington A. Recognition and management of acute kidney injury in the International Society of Nephrology 0by25 Global Snapshot: a multinational cross-sectional study. *The Lancet.* 2016 May 14;387(10032):2017-25.
6. Lameire N, Van Biesen W, Vanholder R. The changing epidemiology of acute renal failure. *Nature clinical practice Nephrology.* 2006 Jul 1;2(7):364-77.
7. Sugianto RI, Memaran N, Schmidt BM, Doyon A, Thurn-Valsassina D, Alpay H, Anarat A, Arbeiter K, Azukaitis K, Bayazit AK, Bulut IK. Insights from the 4C-T study suggest increased cardiovascular burden in girls with end stage kidney disease before and after kidney transplantation. *Kidney International.* 2021 Dec 21.
8. Jha V, Chugh KS. Acute renal failure in the tropics.
9. Prakash J, Sen D, Sarat Kumar N, Kumar H, Tripathi LK, Saxena RK. Acute renal failure due to intrinsic renal diseases: review of 1122 cases. *Renal failure.* 2003 Jan 1;25(2):225-33.
10. Kaul A, Sharma RK, Tripathi R, Suresh KJ, Bhatt S, Prasad N. Spectrum of community-acquired acute kidney injury in India: a retrospective study. *Saudi Journal of Kidney Diseases and Transplantation.* 2012 May 1;23(3):619-28.
11. Bagshaw SM, George C, Bellomo R, ANZICS Database Management Committee. A comparison of the RIFLE and AKIN criteria for acute kidney injury in critically ill patients. *Nephrology Dialysis Transplantation.* 2008 May 1;23(5):1569-74.
12. Lewington AJ, Cerdá J, Mehta RL. Raising awareness of acute kidney injury: a global perspective of a silent killer. *Kidney international.* 2013 Sep 1;84(3):457-67.
13. Hsu RK, Hsu CY. The role of acute kidney injury in chronic kidney disease. In *Seminars in nephrology* 2016 Jul 1 (Vol. 36, No. 4, pp. 283-292). WB Saunders.
14. Susantitaphong P, Cruz DN, Cerda J, Abulfaraj M, Alqahtani F, Koulouridis I, Jaber BL. World incidence of AKI: a meta-analysis. *Clinical journal of the American Society of Nephrology.* 2013 Sep 1;8(9):1482-93.
15. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B, Saran R, Wang AY, Yang CW. Chronic kidney disease: global dimension and perspectives. *The lancet.* 2013 Jul 20;382(9888):260-72.
16. Kumar V, Jha V. Kidney Disease in South Asia. In *Chronic Kidney Disease in Disadvantaged Populations* 2017 Jan 1 (pp. 139-148). Academic Press.
17. Basu G, Chrispal A, Boorugu H, Gopinath KG, Chandy S, Prakash JA, Thomas K, Abraham AM, John GT. Acute kidney injury in tropical acute febrile illness in a tertiary care centre—RIFLE criteria validation. *Nephrology Dialysis Transplantation.* 2011 Feb 1;26(2):524-31.
18. Lameire NH, Bagga A, Cruz D, De Maeseneer J, Endre Z, Kellum JA, Liu KD, Mehta RL, Pannu N, Van Biesen W, Vanholder R. Acute kidney injury: an increasing global concern. *The Lancet.* 2013 Jul 13;382(9887):170-9.
19. Singh NP, Ganguli A, Prakash A. Drug-induced kidney diseases. *JAPI.* 2003 Oct;51(975):e6.
20. Mehta RL, Pascual MT, Soroko S, Savage BR, Himmelfarb J, Ikizler TA, Paganini EP, Chertow GM, Program to Improve Care in Acute Renal Disease (PICARD). Spectrum of acute renal failure in the intensive care unit: the PICARD experience. *Kidney international.* 2004 Oct 1;66(4):1613-21.
21. Uchino S, Kellum JA, Bellomo R, Doig GS, Morimatsu H, Morgera S, Schetz M, Tan I, Bouman C, Macedo E, Gibney N. Acute renal failure in critically ill patients: a multinational, multicenter study. *Jama.* 2005 Aug 17;294(7):813-8.
22. Schiff H, Lang SM, Fischer R. Daily hemodialysis and the outcome of acute renal failure. *New England Journal of Medicine.* 2002 Jan 31;346(5):305-10.
23. Chertow GM, Burdick E, Honour M, Bonventre JV, Bates DW. Acute kidney injury, mortality, length of stay, and costs in hospitalized patients. *Journal of the American Society of Nephrology.* 2005 Nov 1;16(11):3365-70.
24. Coca SG, Yusuf B, Shlipak MG, Garg AX, Parikh CR. Long-term risk of mortality and other adverse outcomes after acute kidney

injury: a systematic review and meta-analysis. American journal of kidney diseases. 2009 Jun 1;53(6):961-73.

25. Mc CM. Paediatric acute kidney injury management in an African setting.