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ORIGINAL ARTICLE

Acute kidney injury outcomes at 90 days at a South African academic hospital

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ABSTRACT

Background: Acute kidney injury (AKI) remains a serious problem in Africa. Most studies from sub-Saharan Africa are retrospective in design and report on only short-term, in-hospital outcomes. There remains a paucity of prospective data on the long-term outcomes of AKI in sub-Saharan Africa.
Methods: We performed a prospective cohort study from 1 January to 30 June 2016. AKI was diagnosed and staged according to KDIGO AKI 2012 criteria. Patients attending an academic hospital in Cape Town, South Africa were followed up for 90 days or more. Outcome was a composite of either chronic kidney disease (CKD) (eGFR <60 mL/min/1.73 m^2), end-stage kidney disease (ESKD) (eGFR <15 mL/min/1.73 m^2) or death.
Results: A total of 113 patients were included of whom 64 (57%) reached the composite outcome. Those reaching this outcome were older (47.5 years vs. 35 years, P = 0.02) and were more likely to have had a history of hypertension (35.9% vs. 16.3%, P = 0.02). The most common causes of AKI were sepsis (33%), drugs and toxins (16%) and glomerular disease (12%). Older age (OR 2.3, 95% CI 1.03–5.12, P = 0.04) and a history of hypertension (OR 2.9, 95% CI 1.15–7.17, P = 0.02) predicted the composite outcome on univariable logistic regression; however, only a history of hypertension was associated on the multivariable model (adjusted OR 1.27, 95% CI 1.04–1.56, P = 0.02). **Conclusions:** In African patients with AKI, the composite outcome of CKD, ESKD and death at 90 days or more was high. Interventions to prevent the progression of patients with CKD are needed because access to chronic renal replacement therapy in the public sector of South Africa is limited.

Keywords: acute kidney injury; outcomes; 90 days; chronic kidney disease; death; end-stage kidney disease; South Africa.

BACKGROUND

Acute kidney injury (AKI) is a serious illness, especially in Africa where healthcare resources are limited. AKI is broadly defined as the abrupt loss of kidney function occurring within hours to days and characterised by the accumulation of waste products of metabolism [1]. Most studies on the condition from Africa are retrospective and describe patients with community-acquired AKI [2-4]. The burden of the AKI in sub-Saharan Africa is largely unknown but a recent study from Cape Town, South Africa, reported an incidence rate of 3.4% [3].

Major risk factors for AKI in sub-Saharan Africa include HIV infection, chronic kidney disease (CKD) and non-communicable diseases (NCDs) such as diabetes mellitus and hypertension [5]. Causes of AKI in Africa are usually multifactorial and include sepsis, hypoperfusion states due to diarrhoeal disease, nephrotoxic drugs and herbal remedies, vascular diseases such HIV-associated thrombotic thrombocytopenic purpura and haemolytic-uraemic syndrome, glomerular diseases and pregnancy-related complications [1].

The mortality associated with AKI increases with the severity of the condition [6]. Studies from South Africa have reported in-hospital mortality rates up to 48%, depending on the cause and disease severity [2,3,7]. AKI

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and CKD are increasingly recognised as interconnected syndromes [8]. Indeed, AKI predisposes to CKD and end-stage kidney disease (ESKD) and CKD predisposes to AKI [8,9]. The reported kidney recovery rate from the African continent following an episode of AKI ranges from 31% up to 80% [3,4], whereas the corresponding rate of CKD ranges from 13% to 45% [1,4]. As a result of the paucity of prospective data on the long-term consequences of AKI from sub-Saharan Africa, we undertook this study to describe the 90-day composite outcome of CKD, ESKD and death.

METHODS

Study design, population and setting

This was a prospective cohort study of all adult patients (≥18 years of age) with suspected AKI referred to the adult nephrology service at Tygerberg Hospital in Cape Town, South Africa from 1 January to 30 June 2016. The hospital is a 1,380 bed facility that offers secondary and tertiary level care to patients dependent on the public sector in the eastern metropole of Cape Town. It is one of two public hospitals in the city to offer dialysis services, both acute and chronic. Most patients first present to their local clinics and regional hospitals and are referred to adult nephrology services only for further diagnostic work-up such as a kidney biopsy or therapeutic interventions such as kidney replacement therapy, when these are anticipated by the managing team at the peripheral centre. Patients known to have ESKD [based on small kidneys on ultrasound examination and an estimated glomerular filtration rate (eGFR) of <15 mL/min/1.73 m^2] with or without chronic renal replacement therapy were excluded. Using a 95% confidence interval, a margin of error of 5%, a population proportion of hospitalised patients with AKI of 10%, and a total inpatient adult population of 50,000, the estimated sample size was 138.

The study was conducted in accordance with the Declaration of Helsinki, and was approved by the Health Research Ethics Committee of Stellenbosch University (protocol number: S15/07/150). All patients gave written, informed consent to participate.

Clinical assessment

The clinical bedside assessment included the history, clinical investigation (including blood pressure measurement, estimation of hydration status and examination of the urine sediment), radiological assessment of kidney sizes and the exclusion of obstruction. Urine output was not monitored. Demographic data collected included age, sex and ethnicity. Clinical data included the presence of comorbid diseases such as hypertension, diabetes mellitus and HIV status, the level of care such as ICU admission, and the suspected cause of AKI. All patients were managed by a nephrologist and clinical decisions, including timing of acute dialysis, were at their discretion. The number of patients that received dialysis as well as the primary indication were documented.

Study definitions

All laboratory measurements were performed by the National Health Laboratory Service, a reference facility. Laboratory parameters included serum creatinine concentrations measured at baseline (if known), at presentation and at 90 or more days of follow-up. In HIV-positive patients, CD4 counts were also documented. We used the Kidney Disease Improving Global Outcomes (KDIGO) definition of AKI: an increase in serum creatinine by ≥26.5 µmol/L within 48 hours, or a rise in serum creatinine concentration to ≥1.5 times the baseline value which is known or presumed to have occurred within the prior 7 days or urine output of <0.5 mL/kg/hr for 6 hours [10]. We further classified the severity of AKI using the KDIGO AKI staging criteria: stage 1: 1.5–1.9 times the baseline serum creatinine value or 26.5 µmol/L increase in serum creatinine from baseline; stage 2: 2.0–2.9 times the baseline serum creatinine value; and stage 3: 3 times the baseline serum creatinine value or serum creatinine more than 354 µmol/L or dialysis initiation. Kidney transplant recipients and chronic dialysis patients were excluded.

For KDIGO AKI staging, the baseline serum creatinine concentration was defined as the last known serum creatinine seven to 365 days before the onset of acute illness. Where this was not available, we back-calculated the baseline serum creatinine concentration assuming an estimated glomerular filtration rate of 100 mL/min/1.73 m^2 for patients aged 18 to 59 years and 75 mL/min/1.73 m^2 for patients 60 years or older, using the Modification of Diet in Renal Disease (MDRD) formula, without a race correction [11].

Patients were followed up prospectively and outcomes were documented at 90 days or more following hospitalisation. Outcome data included complete recovery of kidney function (defined as an eGFR of more than 90 mL/min/1.73 m^2), partial recovery (defined as an eGFR in the range 61–90 mL/min/1.73 m^2), progression to chronic kidney disease (CKD) (defined as an eGFR <60 mL/min/1.73 m^2), progression to end-stage kidney disease (defined as an eGFR <15 mL/min/1.73 m^2) or death.

Composite outcome

The composite outcome was either CKD or ESKD or death at 90 days or more of follow-up.

Statistical analysis

Descriptive continuous variables with a normal distribution were summarised using means and standard deviations, while continuous variables that did not have a normal distribution were recorded as medians and interquartile ranges (IQR). Chi-squared or Fisher's Exact tests were used to compare categorical variables and the Mann–Whitney U test compared continuous variables that were not normally distributed. Student's t-test was used to compare continuous variables with a normal distribution. Univariable and stepwise forward multivariable logistic regression analysis were used to identify predictors of the composite outcome. Covariates included in the latter model included age >50 years, sex, history of hypertension and diabetes, HIV status, dialysis, sepsis, and KDIGO AKI stage. Kaplan–Meier survival estimates along with log-rank P values were also used to identify associations with death up to 90 days. Statistical significance was regarded as a P value <0.05 and 95% confidence intervals (CI) were used. Data were analysed using Stata 16.1.

RESULTS

Between 1 January and 30 June 2016, 123 patients were recruited. A total of ten patients were excluded. Nine patients were lost to follow-up and one was younger than 18 years of age. A total 113 patients were therefore included in the final statistical analysis.

The composite outcome occurred in 64 (57%) patients, while 49 (43%) recovered (Tables 1 and 2). Of the patients who reached the composite outcome, 11 (10%) had CKD, 3 (2.6%) had ESKD and 50 (44%) had died at 90 or more days. The median time to death was 13 (IQR 4–34) days. Although there were five patients with a history of CKD in the group that reached the composite outcome, four reached it because of death. The median follow-up creatinine concentrations for CKD and ESKD were 177 (IQR 132–246) µmol/L and 793 (IQR 772–793) µmol/L and the accompanying eGFR values were 33 (IQR 24–46) mL/min/1.73 m^2 and 6 (IQR 5–6) mL/min/1.73 m^2, respectively. Of the patients that recovered kidney function 34 (30%) made a complete recovery whereas 14 (12%) had recovered partially at 90 days. The median creatinine concentration was 62 (IQR 56–78) µmol/L and the eGFR was 127 (IQR 111–136) mL/min/1.73 m^2 in patients with complete recovery; in those who recorded partial recovery of kidney function, the median creatinine concentration was 93 (IQR 81–112) µmol/L and the eGFR was 73.5 (IQR 69–80) mL/min/1.73 m^2.

Clinically, more patients that reached the composite outcome had a history of hypertension (36% vs. 16%, P = 0.02). The presence of underlying diabetes mellitus or HIV did not impact on outcome nor did the type of ward (56% of the patients were admitted to medical wards). The most common causes of AKI were sepsis (37, 33%), followed by drugs and toxins (18, 16%) and glomerulonephritis (13, 12%), with no statistical differences between groups; however, obstetric causes of AKI were more common in patients who did not reach the composite outcome (12% vs. 2%, P = 0.04).

Baseline serum creatinine concentrations were available between 7 and 365 days prior to acute illness in 67 (59%) patients; in the remaining cases the MDRD formula was used to back-calculate baseline values. The overall baseline and presenting serum creatinine concentrations were 72 (IQR 64–87) µmol/L and 444 (IQR 222–847) µmol/L, respectively. Of all the patients 89 (79%) presented with KDIGO AKI stage 3. Figure 1 shows the frequency for the individual outcomes by KDIGO AKI stage. In patients that were HIV-positive, the overall median CD4 count was 145.5 (IQR 78–305) cells/mm^3.

A total of 41% of patients did not have baseline serum creatinine tests 7 to 365 days prior to acute illness, most of whom were in the group that reached the composite outcome (28, 61%).

Table 1. Outcomes at ≥90 days.

Outcomes	Total = 113
Composite outcome	
CKD, ESKD or death, n (%)	64 (57)
Individual outcomes	
CKD (eGFR <60 mL/min/1.73 m^2), n (%)	11 (9.7)
Serum creatinine (µmol/L), median (IQR)	177 (132–246)
eGFR (mL/min/1.73 m^2), median (IQR)	33 (24–46)
ESKD (eGFR <15 mL/min/1.73 m^2), n (%)	3 (2.6)
Serum creatinine (µmol/L), median (IQR)	793 (772–793)
eGFR (mL/min/1.73 m^2), median (IQR)	6 (5–6)
Death, n (%)	50 (44)
Total recovery	49 (43)
Complete (eGFR >90 mL/min/1.73 m^2), n (%)	34 (30)
Serum creatinine (µmol/L), median (IQR)	62 (56–78)
eGFR (mL/min/1.73 m^2), median (IQR)	127 (111–136)
Partial (eGFR 61–90 mL/min/1.73 m^2), n (%)	14 (12.4)
Serum creatinine (µmol/L), median (IQR)	93 (81–112)
eGFR (mL/min/1.73 m^2), median (IQR)	73.5 (69–80)

Abbreviations: CKD, chronic kidney disease; ESKD, end-stage kidney disease; eGFR, estimated glomerular filtration rate; IQR, interquartile range.

Table 2. Comparison of demographic, clinical, laboratory and renal replacement therapy data in relation to composite outcome.

	Total	Composite outcome reached		P value
		Yes	No	
Total, n (%)	113 (100)	64 (57)	49 (43)	
Demographic data				
Age in years, median (IQR)	41 (31–57)	47.5 (33.5–58.5)	35 (29–53)	0.02
Female, n (%)	61 (54)	33 (52)	28 (57)	0.56
Ethnicity, n (%)				
Black	58 (51.3)	28 (44)	30 (61)	0.14
Mixed-race	49 (43)	31 (48)	18 (37)	
White	6 (5)	5 (8)	1 (2)	
Clinical data				
Ward, n (%)				
Medical	63 (56)	37 (58)	26 (53)	0.06
Surgical	10 (9)	8 (13)	2 (4)	
Obstetric	7 (6)	1 (2)	6 (12)	
ICU, n (%)	33 (29)	18 (28)	15 (31)	
HIV positive, n (%)	48 (43)	23 (36)	25 (51)	0.11
History of hypertension, n (%)	31 (27)	23 (36)	8 (16)	0.02
History of diabetes mellitus, n (%)	17 (15)	12 (19)	5 (10)	0.21
History of chronic kidney disease, n (%)	5 (4)	5 (8)	0 (0)	0.07
Cause(s) of AKI, n (%)				
Sepsis	37 (33)	18 (28)	19 (39)	0.23
Drugs and toxins[§]	18 (16)	11 (17)	7 (14)	0.68
Glomerulonephritis[#]	13 (12)	10 (16)	3 (6)	0.12
Crush syndrome	9 (8)	5 (8)	4 (8)	1.00
Diarrhoeal disease	8 (7)	4 (6)	4 (8)	0.72
Obstetric complications[$]	7 (6)	1 (2)	6 (12)	0.04
Acute pancreatitis	4 (4)	3 (5)	1 (2)	0.63
Other[*]	43 (38)	30 (47)	13 (27)	0.03
Laboratory data				
Baseline serum creatinine (µmol/L), median (IQR)	72 (64–87)	75 (65–87)	69 (60–88)	0.22
Presenting serum creatinine (µmol/L), median (IQR)	444 (222–847)	500 (279.5–883.5)	347 (197–693)	0.07
KDIGO AKI stage, n (%)				
1	10 (9)	4 (6)	6 (12)	0.33
2	14 (12)	6 (9)	8 (16)	0.27
3	89 (79)	54 (84)	35 (72)	0.10
CD4 count (cells per mm^3), median (IQR)	145.5 (78–305)	117.5 (59–247)	252.5 (94.5–335)	0.12
Renal replacement therapy				
Offered dialysis, n (%)	22 (20)	14 (22)	8 (16)	0.46
Dialysis indications, n (%)				
Hyperkalaemia	12 (11)	7 (11)	5 (10)	0.77
Pulmonary oedema	4 (3.5)	3 (4.7)	1 (2.0)	
Fluid overload	2 (1.8)	1 (1.6)	1 (2.0)	
Metabolic acidosis	2 (1.8)	2 (3.1)	0 (0)	
Uraemic encephalopathy	1 (0.9)	0 (0)	1 (2.0)	
Other	1 (0.9)	1 (1.6)	0 (0)	
Modality, n (%)				
IHD	19 (17)	12 (19)	7 (14)	0.28
SLEDD	2 (1.8)	2 (3.1)	0 (0)	
IHD and SLEDD	1 (0.9)	0 (0)	1 (2.0)	
Number of dialysis sessions, median (IQR)	4 (2–9)	3.5 (1–12)	4.5 (2.5–6.0)	0.99
Dialysis duration (days), median (IQR)	6 (2–9)	3 (2–22)	7.5 (4.5–8.5)	0.82

Abbreviations: IQR, interquartile range; ICU; intensive care unit; HIV; human immunodeficiency virus; AKI, acute kidney injury; KDIGO, Kidney Disease Improving Global Outcomes; IHD, intermittent haemodialysis; SLEDD, slow low efficiency daily dialysis. [§]Drugs and toxins: non-steroidal anti-inflammatory drugs, trimethoprim–sulfamethoxazole, amphotericin B, anti-tuberculous therapy, radiocontrast media, tenofovir disoproxil fumarate, metformin, gentamicin, ethylene glycol poisoning, indoxacarb; [#]Glomeronephritis: lupus nephritis, crescentic nephritis, HIV-associated nephropathy, anti-glomerular basement membrane disease, IgA nephropathy; [$]Obstetric: pre-eclampsia and haemolysis, elevated liver enzymes and low platelets, post-partum haemorrhage, placental abruption; [*]Other: stab chest; stab abdomen; gunshot wound; acute liver failure; abdominal compartment syndrome; perforated duodenal ulcer; renal arterial dissection due to fibromuscular dysplasia; malignancies such as diffuse large B-cell lymphoma, bladder fibrosarcoma, cervix carcinoma and multi-level spinal metastases; burn wounds; bowel perforation; suprarenal clamp during abdominal aortic aneurysm repair; thrombotic microangiopathy due to thrombotic thrombocytopenic purpura, atypical haemolytic-uraemic syndrome and malignant hypertension; infective endocarditis. Most patients experienced multiple, overlapping causes of AKI.

Overall, 22 (20%) patients received RRT. The most common indication for initiating RRT was hyperkalaemia (12/22, 55%), followed by pulmonary oedema (4/22, 18%), fluid overload (2/22, 9%), metabolic acidosis (2/22, 9%) and uremic encephalopathy (1/22, 5%). Intermittent haemodialysis was the most common modality used (19/22, 86%). The overall number of dialysis sessions was 4 (IQR 2–9) and the total duration of dialysis was 6 (IQR 2–9) days.

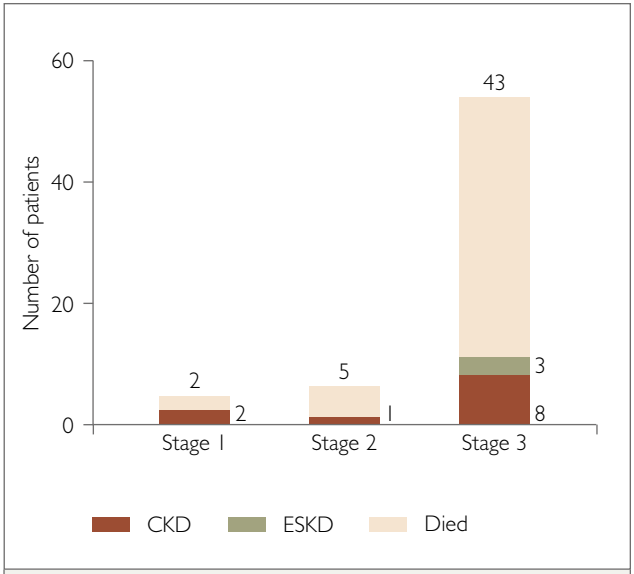


Figure 1. Individual outcomes of chronic kidney disease, end-stage kidney disease and death by KDIGO AKI stage.
Abbreviations: KDIGO, Kidney Disease Improving Global Outcomes; AKI, acute kidney injury; CKD, chronic kidney disease; ESKD, end-stage kidney disease.

Age more than 50 years (crude odds ratio (OR) 2.3, 95% CI 1.03–5.12, P = 0.04) and history of hypertension (crude OR 2.9, 95% CI 1.15–7.17, P = 0.02) were the only predictors of the composite outcome on univariable logistic regression analysis (Table 3). On stepwise forward multivariable logistic regression, only a history of hypertension was associated with the composite outcome (adjusted OR 1.27, 95% CI 1.04–1.56, P = 0.02).

The Kaplan–Meier survival estimate for overall survival can be seen in Figure 2A. On these survival estimates there were no associations with 90-day mortality regarding sex (log-rank, P = 0.64), HIV (log-rank, P = 0.99), history of hypertension (log-rank, P = 0.61), history of diabetes mellitus (log-rank, P = 0.74), KDIGO AKI stage (log-rank, P = 0.20) (Figure 2B), type of ward (log-rank, P = 0.05) or RRT (log-rank, P = 0.84) (Figure 2C).

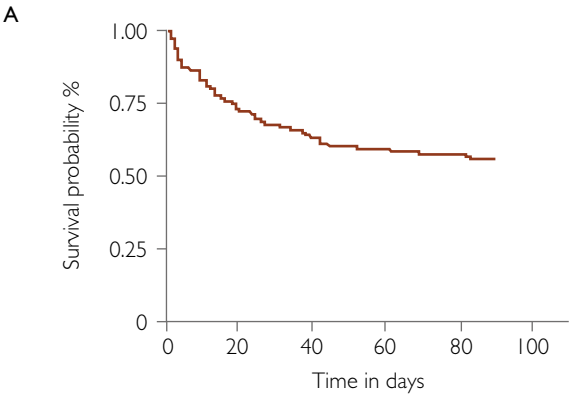
DISCUSSION

Our study highlights the relatively high mortality associated with the development of AKI and emphasises the seriousness of the disease in the African context. We confirm the outcomes recently reported [3]. Our reported mortality rate may be an underestimate of its true value since we included only patients that were referred to our nephrology service. The main factor responsible for the observed high mortality may be late presentation; 84% of patients in the group that reached the composite outcome presented with KDIGO AKI stage 3. Previous studies have also found this to be a major factor [2,3]. Another study from Cape

Table 3. Univariable logistic regression for the composite outcome at ≥90 days.

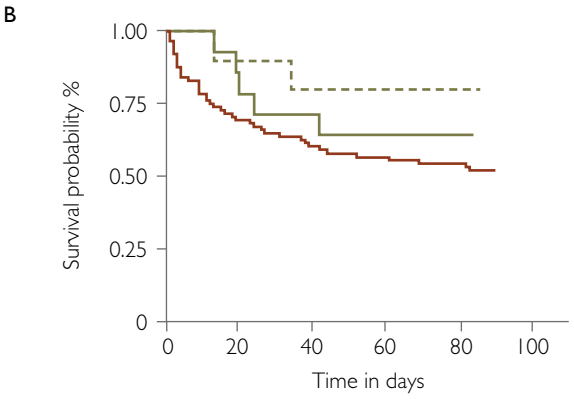
Variable	Univariable logistic regression			Stepwise forward multivariable logistic regression		
	Crude OR	P value	95% CI	Adjusted OR	P value	95% CI
Age >50 years	2.3	0.04	1.03–5.12			
Female sex	0.8	0.56	0.38–1.69			
HIV positive	0.5	0.11	0.25–1.15			
History of hypertension	2.9	0.02	1.15–7.17	1.27	0.02	1.04–1.56
History of diabetes mellitus	2.0	0.21	0.66–6.21			
Ward (reference medical ward)						
Surgical	2.8	0.21	0.55–14.33			
Obstetric	0.1	0.05	0.01–1.03			
ICU	0.8	0.69	0.36–1.97			
Sepsis	0.6	0.21	0.28–1.33			
KDIGO AKI stage (reference Stage 1)						
Stage 2	1.1	0.89	0.22–5.86			
Stage 3	2.3	0.22	0.61–8.79			
Dialysis	1.4	0.46	0.55–3.75			

Abbreviations: ICU, intensive care unit; HIV, human immunodeficiency virus; AKI, acute kidney injury; KDIGO, Kidney Disease Improving Global Outcomes.



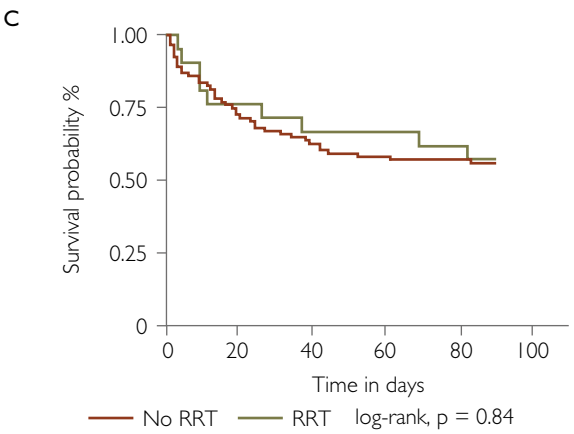
Number at risk

	112	82	70	66	63	0



Number at risk

KDIGO AKI stage 1	10	9	8	8	8	0
KDIGO AKI stage 2	14	12	10	9	9	0
KDIGO AKI stage 3	88	61	52	49	46	0



Number at risk

No RRT	91	66	56	52	50	0
RRT	21	16	14	14	13	0

Figure 2. Kaplan–Meier survival curves with associated log-rank P values for the overall cohort (A), KDIGO AKI stage (B) and RRT (C) for death up to 90 days.

Abbreviations: KDIGO, Kidney Disease Improving Global Outcomes; AKI, acute kidney injury; RRT, renal replacement therapy.

Town reported a similar overall mortality rate of 39% with a high proportion of patients also presenting with KDIGO AKI stage 3 (71%) and speculated that late referral may have resulted from delays in detecting and diagnosing worsening illness severity in hospital patients [2]. Our hospital offers tertiary-level care and is one of only two hospitals in the Cape Town metropole to offer acute dialysis to patients dependent on the public sector. With most patients developing community-acquired AKI [2], the point of entry for most patients accessing public health care is usually at primary or secondary level. Only when the referring centre anticipates that acute dialysis may be required, will patients be referred. Other potential factors may include difficulty for patients to enter the healthcare system because of rural domicile and poor access to transport, delays in AKI diagnosis and/or hindrance in the initiation of general therapies such as intravenous fluids and antibiotics.

We found a large proportion (10%) of patients with CKD. This finding was similar to a systematic review that reported a rate of 13% [1]. Since most patients presented with KDIGO AKI stage 3, with a median serum creatinine concentration of 602 (IQR 347–941) µmol/L, it is possible that some may have had acute-on-chronic kidney disease. In support of this was the finding that more patients that reached the composite outcome had a history of hypertension, which may have been secondary to undiagnosed CKD. Also, because our patients were relatively young, they were less likely to visit primary healthcare facilities and, as a result, the likelihood of screening tests for kidney disease was low.

This large proportion of patients with CKD at 90 days or more is of great concern. Many of these patients would not have been followed up at primary healthcare level and therefore would not have received interventions to prevent progression to ESKD. Patients that progress to ESKD are unlikely to be offered chronic renal replacement therapy (RRT) due to current resource constraints and rationing of the treatment [12].

Age more than 50 years and hypertension were predictors of the composite outcome on univariable logistic regression, whereas hypertension was the only predictor on a multivariable model. These findings are expected since it is usually the older population with underlying cardiovascular disease that progresses to these endpoints. Regarding hypertension, a recent study from South Africa reported that nearly 57% of patients known with hypertension had uncontrolled blood pressure [13]. As a result, we speculate that poor blood pressure control may have resulted in hypertensive target organ damage increasing the risk of CKD and ESKD due to reduced renal reserve and increased risk of death due to left ventricular hypertrophy. Another

study, from Cape Town, identified only mechanical ventilation as a predictor of death [3].

South Africa continues to fight dual pandemics of NCDs and HIV infection. In the current study, the proportion of patients with a history of hypertension and diabetes mellitus seems to mirror the current national prevalence of these diseases [14,15]. With NCDs on the rise in sub-Saharan Africa, the incidence and prevalence of AKI is anticipated to increase. With an already overburdened healthcare sector and limited resources, the expected outcome for many patients with AKI is poor. Despite South Africa having one of the largest anti-retroviral roll-out programmes in the world, HIV continues to plague all levels of health care. The overall CD4 count was only 145 cells per mm^3. This indicates that many patients with HIV continue to be diagnosed late or exercise poor adherence to treatment that may be related to, amongst other factors, adverse drug effects [16]. Notwithstanding the late diagnosis of HIV, there was no difference in the HIV status in patients who did or did not reach the composite outcome. This may have resulted from the small sample size. Whereas 70% of the HIV-positive patients were in medical wards, nearly 40% of HIV-negative patients were admitted to the ICU. Since most (91%) of the HIV-positive patients reached the composite outcome due to death, we speculate that clinicians considered the prognosis to be poor. Despite this, previous studies have reported no differences regarding in-hospital mortality of HIV-positive and -negative patients with AKI [2,17].

The strength of this study is its prospective design that addresses the paucity of prospective AKI studies reporting on 90-day or more outcomes from the African continent. Also, our loss-to-follow-up rate was low. However, this study had several limitations. It is a small, single-centre study over a relatively short observation period. We included only patients that were referred to our nephrology service, which may have introduced selection bias. Many patients with KDIGO AKI stage 1 are likely to be managed at primary and secondary level, whereas those anticipated to require dialysis are likely to be referred.

CONCLUSIONS

AKI in the African setting carries a very high mortality and risk of patients developing chronic or end-stage kidney disease. Interventions to prevent progression of patients with CKD are needed because access to chronic renal replacement therapy in the public sector of South Africa is limited.

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Conflicts of interest

None

REFERENCES

1. Olowu WA, Niang A, Osafo C, Ashuntantang G, Arogundade FA, Porter J, et al. Outcomes of acute kidney injury in children and adults in sub-Saharan Africa: a systematic review. Lancet Glob Health. 2016; 4:e242-e250.
2. Chothia M-Y, Ramsunder N. In-hospital mortality of HIV-positive patients with acute kidney injury a decade after the roll-out of anti-retroviral therapy in Cape Town, South Africa. Afr J Nephrol. 2019; 22:46-53.
3. Dlamini TA, Heering PJ, Chivese T, Rayner B. A prospective study of the demographics, management and outcome of patients with acute kidney injury in Cape Town, South Africa. PloS ONE. 2017; 12:e0177460.
4. Variava M, Mashabane M, Bentley A, Naicker S. Epidemiology and outcomes of dialysis-requiring acute kidney injury at Chris Hani Baragwanath Hospital. Wits J Clin Med. 2019; 1:31-36.
5. Davids MR, Chothia M-Y, Wearne N, Davidson B, McCulloch M. Nephrology in South Africa. Nephrology Worldwide. 2021:55-73.
6. Uchino S, Bellomo R, Goldsmith D, Bates S, Ronco C. An assessment of the RIFLE criteria for acute renal failure in hospitalized patients. Crit Care Med. 2006; 34:1913-1917.
7. Friedericksen D, Van der Merwe L, Hattingh T, Nel D, Moosa M. Acute renal failure in the medical ICU still predictive of high mortality. S Afr Med J. 2009; 99:873-875.
8. Chawla LS, Eggers PW, Star RA, Kimmel PL. Acute kidney injury and chronic kidney disease as interconnected syndromes. N Engl J Med. 2014; 371:58-66.
9. Coca SG, Singanamala S, Parikh CR. Chronic kidney disease after acute kidney injury: a systematic review and meta-analysis. Kidney Int. 2012; 81:442-448.
10. Kidney Disease: Improving Global Outcomes (KDIGO) Acute Kidney Injury Work Group. KDIGO Clinical Practice Guideline for Acute Kidney Injury. Kidney Int Suppl. 2012; 2:1-138.
11. Bouchard J. Estimating baseline serum creatinine for assessing acute kidney injury: not a one size fits all approach. Kidney Int Rep. 2021; 6:562.
12. Moosa MR, Luyckx VA. The realities of rationing in health care. Nat Rev Nephrol 2021:1-2.
13. Masilela C, Pearce B, Ongole JJ, Adeniyi OV, Benjeddou M. Cross-sectional study of prevalence and determinants of uncontrolled hypertension among South African adult residents of Mkhondo municipality. BMC Public Health. 2020; 20:1-10.
14. Berry KM, Parker W-a, Mchiza ZJ, Sewpaul R, Labadarios D, Rosen S, et al. Quantifying unmet need for hypertension care in South Africa through a care cascade: evidence from the SANHANES, 2011-2012. BMJ Glob Health. 2017; 2:e000348.
15. Coetzee A, Mason D, Hall DR, Conradie M. Prevalence and predictive factors of early postpartum diabetes among women with gestational diabetes in a single-center cohort. Int J Gynecol Obstet. 2018; 142:54-60.
16. Azia IN, Mukumbang FC, Van Wyk B. Barriers to adherence to antiretroviral treatment in a regional hospital in Vredenburg, Western Cape, South Africa. South Afr J HIV Med. 2016; 17:476
17. Vachiat AI, Musenge E, Wadee S, Naicker S. Renal failure in HIV-positive patients—a South African experience. Clin Kidney J. 2013; 6:584-589.