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Acute kidney injury identification and management: Clinical audit

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Abstract

Acute kidney injury is one of the major health concerns in Sudan, a cause of frequent morbidity and mortality, in this retrospective study we assess the adherence of junior doctors in El-Obied Teaching Hospital to proper Acute kidney injury identification and management then applying interventions demonstrating the ideal way to deal with acute kidney injury. The first division consisted of 7 patients with first stage AKI, 17 patients were second stage and 31 were stage three, 41.8% suffered from oliguria or anuria problems. The second division consisted of 11 patients with stage 1 AKI, 12 patients were second stage and 32 were stage three, 49.1% suffered from oliguria or anuria problems. The patient demographics and AKI staging were statistically non-significant. Adherence to the guidelines regarding ordering the proper investigations and treatment plan after implantation of the intervention was associated with improved patients outcome (80% to 92.7%, p=0.001) and decrease the intensive care unit (ICU) \ high-dependency unit (HDU) admission from 3.6% to 0%. p <0.001. Overall practice towards acute kidney injury improved and junior doctors have better compliance to the adopted guidelines and patients have better outcomes.

Introduction

Acute kidney injury (AKI) is a broad clinical syndrome that can result from various aetiologies, including specific kidney diseases (e.g., acute glomerular diseases, interstitial diseases, and vascular pathologies); non-specific conditions (e.g., toxic injury, ischemia); as well as extrarenal pathologies. Clinical manifestations of AKI can range from mild loss of kidney functions (acid-base imbalance, fluid overload, and electrolytes disturbances) to severe kidney impairments that require temporary renal replacement therapy.

On 2003, the kidney disease: Improving Global Outcomes (KDIGO), integrated all of the previous criteria into a single definition that is considered most accepted globally [1]. It states that "AKI is defined as any of the following (Not Graded): an increase in serum creatinine by ≥ 0.3 mg/dl (≥ 26.5 μmol/l) within 48 hours; or an increase in serum creatinine to ≥ 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days; or a urine volume < 0.5 ml/kg/h for 6 hours".

In 2013, the global incidence of AKI using the KDIGO definition was found to be 22 percent according to a meta-analysis that included more than 3.5 million patients recruited from hospital settings. Another study in 2015 that included 1802 patients from intensive care units from 33 countries reported an incidence of 57 percent according to the KDIGO definition [2-7]. It is worth noting that most of the included data originated from high income countries.

In Africa, the epidemiology of AKI is thought to be different due to the different rates of exposure to risk factors [8]. In Sudan, there is little published data about the burden and outcomes of AK [9-13]. In 2017, a study that included 6769 Sudanese patients from a tertiary hospital setting reported a prevalence of 5.7 percent [9]. The commonest aetiologies were sepsis, volume depletion, obstructive uropathy, heart failure, acute glomerulonephritis, and severe malaria. In that study, the mortality rate of AKI was 31.2 percent, and the full recovery was seen in 35.7 percent. Another study in 2020 that included 187 Sudanese patients from intensive care units found a high incidence of AKI (39%) [10]. Whereas in another study, the incidence of AKI in Sudanese patients undergoing coronary angiography was 31.9% [13].

Aim of audit: In this study, we audited the practice of doctors at El-Obied Hospital regarding their response to managing AKI. We specifically examined the practice of AKI detection, prevention of deterioration and the initiation of appropriate treatment.

Material and methods

This is audit of quality, carried in El-Obied teaching Hospital, Sheikan locality, North_Kordfan state, Sudan, during the period January-April 2022.

During the first phase of the study data was collected from patient's records retrospectively through 6 weeks including all cases of AKI, a total number of 55 patients using a list and according to KDIGO

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guidelines in identification and managing AKI. Data collected from patients records during five days from Saturday to Wednesday.

Regarding interventions made to improve quality of practice, junior doctors were submitted to educational program involve the following:

- Three educational sessions in renal system, focusing on identifying and proper management AKI based on KDIGO criteria. Each session last three hours and presented by consultant of internal medicine.
- Posters demonstrating how to deal with AKI were placed in all outpatient and inpatient departments.
- Renal charts were printed and distributed to all sets of junior doctors and reserved in medical director office.

The second phase of the study started 2 months after interventions was made, data was collected retrospectively from patient records including the first 55 patients during this period using list and according to KDIGO guidelines and data was reported as Either they adhere to guidelines or not.

Data from phase 1 and phase 2 were entered and analysed using Statistical Package for Social Sciences version 23 (SPSS-23). Continuous data were presented as mean and standard deviation, categorical data as frequencies and percentages. The difference between phase 1 and phase 2 were assessed using chi-square test. P. Value less than 0.05 were considered to be significant.

Audit standards: Acute kidney injury is defined, managed and staged according to UK renal association AKI guidelines published in 2012 [14].

Ethical approval: Written ethical clearance was obtained from the Medical director of El-Obied Teaching hospital and the study approved by local ethical committee at Department of Community Medicine, Faculty of Medicine, University of Kordofan.

Patient consent to review their medical records was not required by the ethics committee, cause accessing patient was not feasible and impractible ,and this compliance with the Helsinki declaration; For medical research using identifiable human material or data, such as research on material or data contained in biobanks or similar repositories, physions must seek informed consent for its collection,storage and reuse.there may be exceptional situations where consent would be impossible or impractible to obtain for such research. In such situations the research may be done only after consideration and approval and reaserch ethics committee. Codes were provided instead of names to insure confidentiality.

Results

In the first phase of the study 55 patients were recruited consisting of 27 females and 28 males with an average age of 56.1 years 45.5% of them had comorbidities most commonly hypertension (30.9%), renal chart were done to 65.5% of the patients and the patients were managed mainly in the general medicine department (76.4%) and in the renal unite (9.1%). In the second phase of the study - after the intervention was implemented - 55 patients were included, made up of 32 females and 23 males with an average age of 52.7 years 25.5% of them had comorbidities most commonly hypertension (14.5%), renal chart were done to 92.7% of the patients and the patients also were managed primarily in the general medicine department (72.7%) and in the renal unite (16.4%). Table (1). The first division consisted of 7 patients with first stage AKI, 17 patients were second stage and 31 were stage three, 41.8% suffered from oliguria or anuria. The second division consisted of 11 patients with stage 1 AKI, 12 patients were second stage and 32 were stage three, 49.1% suffered from oliguria or anuria problems. No association was found between the stage of AKI or the presence of oliguria or anuria and the patients' outcome in either of the study phases (P=0.749, p=0.172) respectively.

Ordering the appropriate investigations and the management of when treating patients presenting with AKI before and after intervention, during the first and second phases is shown in (Table 1). The gold standard of 100% compliance as defined by the UK renal association's management of AKI guideline was not achieved in the first phase of our study.

In the second phase of the study after implantation of the intervention, a significant improvement was reported in the documentation performance of urine dipstick (8 to 37,p=0.43) , checking baseline creatinine after 48 hours (35 to 45, p< 0.32) , execution of renal chart (36 to 51, p= 0.011) , appropriate ordering of us (37 to 55 p< 0.001) and also the percentage of the patients admitted for more than 7 days decreased (31 to 20, p< 0.001) .

In addition improving adherence to the guidelines regarding ordering the proper investigations and treatment plan after implantation of the intervention was associated with improved patients outcome (44 to 51 p=0.001) and decrease the intensive care unit (ICU) \ high-dependency unit (HDU) admission from 2 to 0. p <0.001. (Figure 1, Table 2).

Discussion

The signs and symptoms of AKI are usually unremarkable until the kidneys stop functioning altogether. It is diagnosed on the basis of an increase in serum creatinine or a decrease in urine output, or both.10

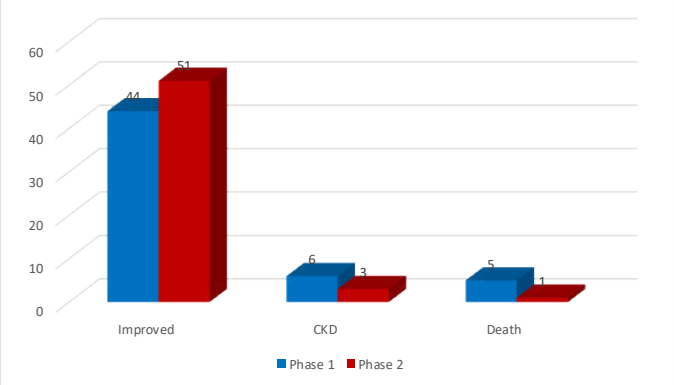

Figure 1. Change in AKI outcome

Table 1. Difference in practice before and after interventions

	Pre-intervention	Post-intervention
Number of patients	55	55
average age	56.1	52.7
average AKI stage	2.43	2.3
Baseline creatinine documented	100%	100%
creatinine after 48 hours	63.6%	81.8%
Urine dip performed	14.5%	67.3
Nephrotoxic drugs stopped	98.2%	100%
Renal doses of drugs prescribed	100%	100%
Renal ultrasound requested or considered on admission	67.3%	100%

Table 2. Different in demographic and characteristics between phase 1 and 2

	Phase 1	Phase 2	p-value
Gender			
Male	28	23	0.001
female	27	32	
Residence			
Rural	27	30	Less than 0.001
Urban	28	25	
ICU admission			
Yes	2	0	Less than 0.001
no	53	55	
Outcome			
Improved	44	51	
CKD	6	3	0.001
dead	5	1	
AKI Stage			
Stage 1	7	11	
Stage 2	17	12	Less than 0.001
Stage 3	31	32	
Duration of admission			
less than 7 days	24	35	0.007
more than 7 days	31	20	
Presence of oliguria\anuria			
Yes	23	27	Less than 0.001
no	32	28	

Therefore, if other competing urgent clinical demands coexist with AKI development, clinical teams may not recognize it immediately. In a study done by Phillips et al in Ethiopia, it was demonstrated that recognizing patients with AKI is not only difficult in certain countries but also globally [11]. Patients with AKI need to pay special attention to fluid and hemodynamic status to maximize fluid and hemodynamic status, avoid further nephrotoxic insults, and recognize the underlying cause of their illness as early as possible. This strategy may reverse the acute renal process, if applied early, and prevent kidney failure from progressing .In many cases, it occurs in conjunction with other acute medical problems, and prevention is not always possible. The incidence of AKI is increasing, likely due to the increasing prevalence of comorbid conditions [12].

Since our study was conducted in phases, appropriate gold standard of 100% compliance investigations and management weren't commenced in the first phase of our study according to the guidelines of the UK renal association on AKI management.

The idea behind our intervention is to improve outcomes for patients through a collection of evidence-based methods that when performed together and reliably, lead to better patient outcomes. It is much more likely that the patient will suffer complications if an intervention is missed. There is success in integrating such interventions into the treatment of conditions such as sepsis or ventilator-associated pneumonia that pose a significant risk to life [13].

The most common reported comorbidity in the two phases of our study was found to be hypertension this is similar to the findings reported in the retrospective case series study, whereas it contradicts the parallel Canadian study which reported diabetes mellitus as the most common co-morbid condition in AKI patients [15].

About (41.8%) of patients in the first cohort were having anuria or oliguria and (48.9%) in the second cohort were suffering from anuria and oliguria, our study findings were found to be higher when compared to the findings which reported in the study conducted by Daher, *et al.* in which about (32.6%) the cohort were with oligouric AKI [16]. Also these results were slightly lower when compared to which was reported in the congruent study conducted by Prowle, *et al.* in which (52%) of the participants with AKI were having oliguric AKI [17].

A statistically significant improvement was reported in the documentation performance of urine dipsticks, checking baseline creatinine after 48 hours, executing renal charts, appropriate ordering of ultra sound, stopping nephrotoxic drugs, and decreasing the percentage of patients admitted for more than seven days in the second phase of the study following implementation of the intervention, and according to Tsui, *et al.* in a large urban London hospital, a specially designed care bundle led to significant improvements in fluid status assessment and optimization, urinalysis performance, discontinuation of nephrotoxic medications, urine output monitoring and prescription of renal drugs [18].

A beneficial outcome of our intervention which was found to be associated with improved adherence to guidelines regarding ordering proper investigations and treatment plans following implantation with a decrease in the number of patients admitted to intensive care units (ICU) and high dependency units (HDU), this was found to be in consistent with the study which carried out by Zhao et al in which an intervention known as clinical decision support systems resulted in significant improvement in AKI recognition, investigations and decrease in mortality, also the other congruent study conducted by Sykes et al demonstrated similar findings as certain intervention led to more recognition, better investigation and management approaches regarding AKI [19,20].

Limitations of the current study could be confined and attributed to limited time and resources as the process was time constraint and limited budget. Difficulties in finding computerized facilities and lack of technical tools to get various information (more effort and time to get certain information).

Conclusion

In the current study; outcomes were better after the intervention implemented than before intervention, represented by considerable reduction in number of patients needing intensive care unit (ICU) and high dependency unit (HDU) admissions. This intervention is simple and inexpensive and could be applicable in all healthcare settings to elucidate its effectiveness in improving patient's outcomes. More studies are needed to support this findings adding more reliability and evidence to the current study findings.

Conflict of interest

The author reports no conflicts of interest in this work.

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