Acute Kidney Injury in Adult Nigerians: A Single Centre Experience

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ABSTRACT

Background: Acute Kidney Injury (AKI) is an abrupt and sustained rise in serum creatinine, urine output or both. It is associated with significant morbidity and mortality especially among hospitalised patients. Despite the poor outcome associated with the problem, data is lacking regarding the epidemiology of AKI in developing countries.

Objectives: To determine the incidence of AKI among medical admissions, to study the aetiological pattern, clinical presentation, complications and short-term outcome of the disease; and to determine the predictor of poor outcome among cases studied.

Methodology: This was a retrospective study. The case records of all cases of diagnosed AKI admitted into the medical wards for a period of 2 years was reviewed. AKI was regarded as sudden deterioration in renal function (azotaemia) with or without oliguria; and the absence of any evidence of chronicity.

Results: There were 2431 Medical admissions during the study period and of these, there were 33 cases of AKI with an incidence rate of 13.5 per 1000. Patients were aged 18-95 years with a mean age of 37.4±18.6 years. The commonest presenting symptoms were fever (64.5%), leg swelling (64.5%), vomiting (54.8%) and oliguria (61.2%). 77.4% patients had proteinuria, 64.5% were anaemic while 54.8% had elevated blood pressure. The commonest cause of AKI was Sepsis (45.1%). 61.2% had haemodialysis. Mortality rate was 41.9%. Not having haemodialysis was significantly associated with poor outcome.

Conclusion: AKI is associated with significant morbidity and mortality. Late presentation and delayed or lack of access to dialysis are major difficulties encountered.

Keywords: *Acute, Kidney Injury, Adult Nigerians*

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INTRODUCTION

Acute Kidney Injury (AKI) is a clinical syndrome with a myriad of causes; it is regarded as an abrupt and sustained rise in serum creatinine, urine output or both. Until recently there was no consensus definition of AKI; several published definitions are based on changes of serum creatinine and urine output. The two most recent and highly publicised consensus definitions and classification systems are the Acute Dialysis Quality Initiative's RIFLE[1] criteria and the Acute Kidney Injury Network (AKIN)[2] derived consensus definition. The RIFLE criteria stratify AKI into five groups: renal risk, renal injury, renal failure, renal loss and end stage renal disease (ESRD). This classification has been proposed to allow consistency across studies for greater ability to compare studies. The AKIN definition classifies AKI into three stages, basically discarding the last two stages of the RIFLE classification. There remains some variation in how the criteria are interpreted and used in literature, particularly with respect to the use of urine output criteria, the choice of baseline creatinine, and the use of the change in estimated glomerular filtration rate (GFR) rather than the change in creatinine[3].

The incidence of AKI varies according to the region / population studied i.e. community based, hospital based or intensive care unit (I.C.U.), and

also according to the definition of AKI used for a study. The Incidence is usually high in hospitals and even higher in ICU setting. This high incidence of hospital-acquired AKI is multifactorial; it has been related to an aging population with increased risks of ARF, the high prevalence of nephrotoxic exposures possibly in a hospital setting, and increasing severity of illness [4]. Recent studies in the United States [5,6] and Spain [7]have shown incidences varying between an average of 23.8 cases per 1000 discharges[5] with an increase from 61 to 288 per 100,000 population between 1988 and 2002 [6]. More recently, Ali *et al* reported a high incidence of 1811 cases of AKI per million population over a year[8].Among adult patients from South Africa, Seedat [9] reported an incidence of 20 cases per year per million population. Brazil[10]and North India[11] have a yearly incidence of 7.9 cases per 1000 and 6.4 per 1000 hospital admissions respectively.

In Nigeria, Bamgboye et al reported 175 out of 500 dialysis patients seen in a hospital over a 10 year period [12]. Anochie et al reported an incidence of 11.7 cases of ARF per year among children seen in a hospital[13]. The epidemiology of AKI in developing countries differs from developed worlds; while AKI is prevalent amongst the elderly in developed countries it is particularly commoner in children and young adults in developing countries. This may be a reflection of reduced lifespan in most developing countries, as well as a higher occurrence of infectious diseases in these regions and poor access to basic health care especially in rural and remote areas.

The aetiology of AKI depends on whether it is occurring in the general population (i.e. community acquired), hospitalised patients or critically ill patients in the ICU. A Spanish study[7] identified, acute on chronic renal failure, acute tubular necrosis (ATN), acute glomerulonephritis (AGN) acute interstitial nephritis (AIN), obstructive uropathy, vasculitis amongst others, as the commonest causes of community acquired AKI. Other rare causes are rhabdomyolysis in casualties from massive disasters after earthquakes, or crush injuries. The major causes of hospital-acquired ARF are ischaemic and /or toxin induced ATN, but often the cause is multifactorial and iatrogenic.

Acute renal failure occurs in up to 30% of all ICU admissions and is usually a manifestation of a multiorgan failure syndrome [14]. Common causes of AKI in ICU patients include severe sepsis and septic shock, which has been associated with almost 70% mortality [15]. Volume responsive AKI typically from blood/fluid loss is also common.

AKI is generally viewed as a potentially reversible and benign form of kidney disease compared to CKD, however it may be associated with long term kidney damage and some forms such as sepsis induced AKI is associated with significant morbidity and mortality; of concern is that volume responsive AKI is also associated with significant morbidity and mortality especially in some developing countries due to poverty, illiteracy, harmful customs/ traditional practices and poor access to health care.

Cases of community acquired AKI in developing countries typically present to hospitals late with florid clinical features, this challenges the usefulness of the RIFLE classification and often times leaves no room for adequate care. Despite the poor outcome associated with the problem, data is lacking regarding the epidemiology of AKI in developing countries.

This retrospective observational study sets out to determine the burden of AKI in a tertiary hospital and to study the general pattern of clinical presentation, aetiology, complication and outcome of patients with AKI. The data generated will help in planning targeted health education for communities and improving hospital care.

METHODS

Sampling procedure: UBTH is located in Benin City the capital of Edo State in South-South region of Nigeria with about 400 bed spaces. A register of all cases admitted into the medical wards from August 2007-Sept 2009 were obtained from which the data of all cases of AKI were collated. Information on their socio-demographic, clinical, laboratory findings and

management were obtained. The diagnosis of AKI was made based on a history of sudden onset, sustained oliguria and/or a serum creatinine rise; the absence of evidence to suggest chronicity such as a history >3 months, previous history of renal insufficiency, clinical signs, laboratory and radiological features suggesting Chronic kidney disease (CKD).

Statistical Method: Data entry and management were performed using SPSS statistical software package version 16(SPSS, inc., Chigago, IL). The demographic characteristics, health status and biochemical measurement (i.e. random blood sugar and serum creatinine) of the sample were presented as tables. Data were presented as mean SD for continuous variables and as frequency and percentages for categorical variables.

The main statistical analysis involved the estimation of the crude incidence rates of acute kidney injury for the sample. All p values < 0.05 was regarded as significant and marked with asterisks within tables for ease of recognition. The unadjusted odds ratio (OR) between exposure variables such as, sex, hypertension, sepsis, uraemic encephalopathy, dialysis, and the patient outcome (mortality) was determined by logistic regression analysis.

RESULTS: Out of 2431 medical admissions admitted in the 2 year period, 33 cases had confirmed AKI giving an incidence rate of 13.6 per 1000. Mean age was 37.4±18.6 years with a male to female ratio of 1.2:1. Majority of the patients (74.2%) were in the young age group (Table 1).

Table 1: Age and Sex Distribution of patients

Age group (years)	Male n(%)	Female n(%)	Total n(%)
18-44	12 (38.7)	11 (35.5)	23 (74.2)
45-64	2 (6.4)	0 (0.0)	2 (6.4)
≥65	3 (9.7)	3 (9.7)	6 (19.4)
Total	17 (54.8)	14 (45.2)	31 (100.0)

The commonest clinical presentations included proteinuria (77.4%), anaemia (64.5%), leg swelling (64.5%) and fever (64.5%). Hypertension was seen in 54.8% of cases while 6.4% had Gallop Rhythm suggesting heart failure (see Table 2).

Mean urea was 216±77.7 mg/dl, creatinine 6.2±3.5 mg/dl, potassium 4.8±1.0mmol/L and bicarbonate 16.4± 6.9mmol/L (table 2). The commonest causes of AKI were sepsis (45.1%), Acute glomerulonephritis (22.5%), hypovolaemia (16.1%) and Toxic nephropathy (9.6%) as shown in figure 1.

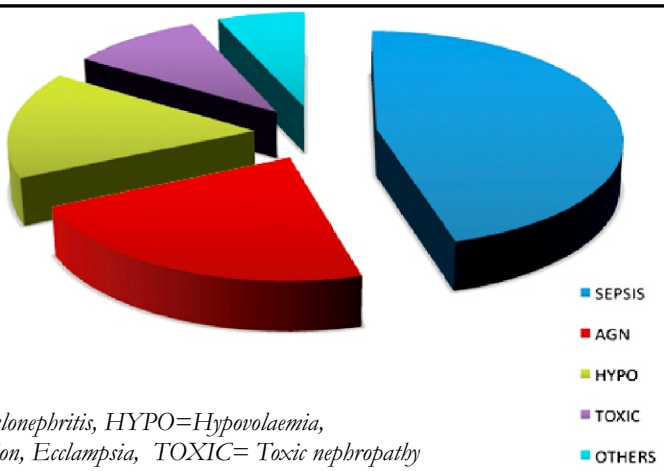
Nineteen out of the 31 cases (61.4%) had haemodialysis. Indications for dialysis were severe azotaemia, encephalopathy, acute pulmonary oedema, gastritis and pericarditis.

Mortality rate was 41.9% (n=13), only 5 of these patients dialysed before death, while 3 died within 24 hours of admission. Specific mortality rate among patients with sepsis induced AKI was 42.8% (6 out of 14). Mean duration of hospital stay among patients who died compared to discharged patients was 5.7± 4.7 and 15.4± 7.8 days respectively

Table 2: Frequency distribution showing patient clinical presentations

Symptoms	Frequency n(%)
Fever	20 (64.5)
Leg swelling	20 (64.5)
Oliguria	19 (61.2)
Vomiting	17 (54.8)
Irrational talk	8 (25.8)
Facial swelling	6 (19.3)
Seizures	5 (16.1)
Breathlessness	3 (9.6)
SIGNS	
Proteinuria	24 (77.4)
Pallor	20 (64.5)
Tachycardia	19 (61.2)
Haematuria	18 (58.0)
Hypertension	17 (54.8)
Crackles	6 (19.3)
Ascites	6 (19.6)
Epigastric tenderness	4 (12.9)
Asterixis	3 (9.6)
Pericardial rub	2 (6.4)
Gallop rhythm	2 (6.4)
Coma	1 (3.2)

Figure 1: Pie chart showing the main aetiologies of Acute Kidney injury



AGN= Acute glomerulonephritis, HYPO=Hypovolaemia,
OTHERS= Obstruction, Ecclampsia, TOXIC= Toxic nephropathy

Table 2: Primary focus of Sepsis.

Focus of sepsis	Frequency (n)
Unknown	4
UTI	3
Pneumonia	2
Leg ulcer	1
GIT	1
Meningitis	1
Post-op sepsis	1
Post-abortal sepsis	1
TOTAL	**14**

Table 3: Laboratory findings of patients.

Parameter	Mean ± SD
Serum creatinine (mg/dl)	6.2 ± 3.5
Potassium (mmol/L)	4.8 ± 1.0
Urea (mg/dl)	216.6 ± 77.7
Bicarbonate (mmol/L)	16.4 ± 6.9
Packed cell volume (%)	28.0 ± 8.7

Table 4: Predictors of Mortality

	Odds Ratio	Confidence Interval (CI)	P value
Dialysis	7.04	1.26-39.32	0.026
Sepsis	0.91	0.16-5.19	0.919
Anaemia	2.27	0.32-15.6	0.407
Hypertension	0.65	0.10-3.89	0.641
Encephalopathy	0.99	0.18-5.27	0.993

DISCUSSION:

The incidence rate of 13.6 per 1000 reported in this study does not differ widely from available data in developing countries [10, 11]. Anochie et al [13] reported an incidence rate of 11.7 per 1000 among children. It is difficult to compare data from studies due to the varying study techniques; e.g. the definition of AKI applied in studies vary, and until recently there was no consensus definition of AKI. Again the incidence rate varies according to the population studied. However one can safely infer that the incidence rate has generally remained stable.

Peculiar to developing countries is the fact that kidney disease appears to be commoner in the young compared to the elderly [16]. This study shows that affected patients where mainly young-middle aged adults. The reason for this may be the high rate of untreated and poorly treated infections among this age-group and the high rate of sepsis induced AKI (40%) compared to other causes of AKI among patients studied confirms this.

Surprisingly, anaemia was very common among the patients (64.%). Anaemia used to be a distinguishing clinical symptom between AKI and chronic kidney disease but it seems that sepsis being a prominent cause of AKI is contributing to the anaemia. Furthermore erythropoietin insufficiency and blood loss precipitating AKI are other factors to be considered[17]. Nutritional anaemia is also generally common in most disadvantaged populations.

All patients studied were uraemic with florid symptoms. This stems from the problem of late diagnosis and referral of patients with AKI. In developing countries community acquired AKI is common and most patients often present late to health facilities due to ignorance and poverty, this is further compounded by failure of clinicians to diagnose the disease early and refer patients for specialised care. The RIFLE classification[1] of AKI was meant to help clinicians detect early signs of acute renal impairment however this is more useful in hospitalized patients who are at risk e.g. post-surgery and ICU admitted patients.

The importance of prompt renal replacement therapy in the setting of persistent symptomatic AKI cannot be over emphasized. This study revealed that not having haemodialysis was significantly associated with patient mortality and patients who died spent less than 5 days in hospital before their demise, some within 24hours. This again confirms the severity of patient's clinical presentation that often times necessitates renal replacement. The high cost and paucity of renal replacement therapy in developing countries remains a problem. However not all cases of AKI would require dialysis if diagnosed early and some cases especially sepsis-induced AKI are associated with high mortality regardless.

Conclusion

AKI is common among medical admissions and is associated with significant morbidity and mortality. Sepsis induced AKI is the commonest and most severe cause of AKI among patients studies. Prevalence of anaemia is very high amongst AKI patients. Lack of access to dialysis is a significant predictor of mortality. Early referral of all suspected cases of AKI to nephrologists for prompt management remains highly recommended.

Our limitation was restricting this study to only medical admissions thereby excluding AKI patients in the ICU and other ward such as the Obstetrics and Gynaecology wards. The reason was to make collation of records less cumbersome and avoid the logistics that would have been involved to pool such data. However obstetricians and surgeons referred some of the patients in this study.

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