Kidney Disease in Africa; Current Insights into the Diagnosis and Management

A team of experts expound on the background, epidemiology, risk factors, diagnosis and management of kidney diseases in Africa.

Introduction

Kidney disease is one of the fastest growing chronic diseases and projected to be the 5th leading cause of years of life lost by the year 2040. Unfortunately, most people are not aware that they have kidney disease until it is advanced. Although much easier to manage in the earlier stages, kidney disease care is costly in the late stages requiring dialysis or a kidney transplant. In this article we discuss the epidemiology, screening and key aspects of management of kidney disease in Africa where resources are limited.

Kidney disease is the 10th leading cause of morbidity and mortality globally with an estimated prevalence of chronic kidneys disease (CKD) of 13.4% in the adults population[1]. CKD is projected to be the 5th leading cause of years of life lost (YLL) by year 2040[2]. The costs associated with treating kidney disease are astronomical and few countries in Africa offer publicly funded chronic hemodialysis and transplant services. Many people are not aware that they have kidney disease early when lower cost interventions are available, particularly in Africa where the burden of kidney disease is high, the availability of specialized nephrology care is low, and the average age of end-stage kidney disease is substantially younger than in Western countries [3]. Increased awareness of kidney disease in Africa is needed to identify unique risk factors associated with kidney disease, expand screening tools for early diagnosis and treatment, and halt the epidemic of kidney disease impacting people during their most economically productive years [3].

Epidemiology of kidney disease in Africa

The epidemiology of kidney disease in Africa varies depending on the population and methods used to define kidney disease. CKD prevalence in Africa ranges from 2% in Cote d'Ivoire to 30% in Zimbabwe with an overall prevalence of 13.9%[4] (Figure 1). Screening programs focusing on early diagnosis of CKD may help mitigate this, but data are lacking. Susceptibility and age of kidney disease onset is affected by several factors including poor maternal health in pregnancy that can impact nephron development and premature birth that decreases nephron endowment. The early age of CKD onset in Africa is driven by the intersection of communicable and non-communicable diseases with HIV being a significant contributor to the burden of CKD [5].

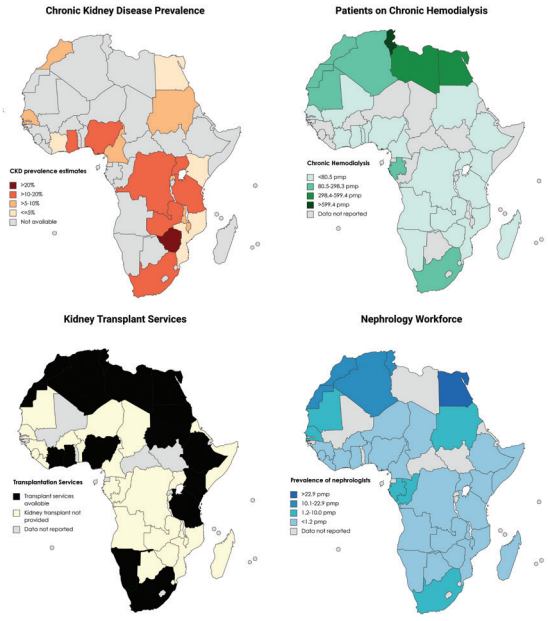

***Figure 1. Maps of CKD prevalence and services for management of CKD in Africa**. Maps presenting the prevalence of CKD based on systematic reviews and meta-analysis focusing on Africa[7], the prevalence of chronic hemodialysis per million population (pmp), countries that offer kidney transplantation, and the prevalence of nephrologists pmp based on the Global Kidney Health Atlas[8].*

Risk factors for kidney disease in Africa

Individuals from Africa have both traditional risk factors (hypertension, diabetes, smoking, diet) as well as unique risk factors such as pregnancy related complications, low birth weight, endemic infections, and genetics (such as APOL1, sickle cell disease) which require special attention. Many of these have been detailed in a 2023 review along with the people who should be screened and how this could be best done[6]. One key concern is the lack of accuracy in using creatinine as a marker of eGFR in this population compared to cystatin C which is better but more expensive. Cost effective studies are needed to find the best way for us to understand the true burden of CKD in Africa.

Acute and Chronic Kidney Disease

Kidney disease is defined based on functional or structural changes to the kidney. Acute kidney injury (AKI) is characterized by an abrupt loss of kidney function and defined based on an increase in serum creatinine or reduction in urine output using the Kidney Disease: Improving Global Outcomes (KDIGO) criteria[9]. AKI is a time delimited event and is followed by acute kidney

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disease (AKD). AKD can occur in the context of subclinical AKI where there is a gradual worsening in kidney function over time and can also occur following AKI when there is incomplete recovery of kidney function. CKD represents a loss of kidney function or structural damage that persists for more than 90 days[5] (Figure 2).

As a patient progresses from acute to chronic kidney disease, definitions incorporate measures of structural damage (i.e., proteinuria or albuminuria). Established risk factors for CKD progression following AKI include prolonged or severe AKI and markers of structural injury during AKI/AKD that can lead to maladaptive repair and renal fibrosis[10]. Additional studies are needed to define the most important risk factors in Africa.

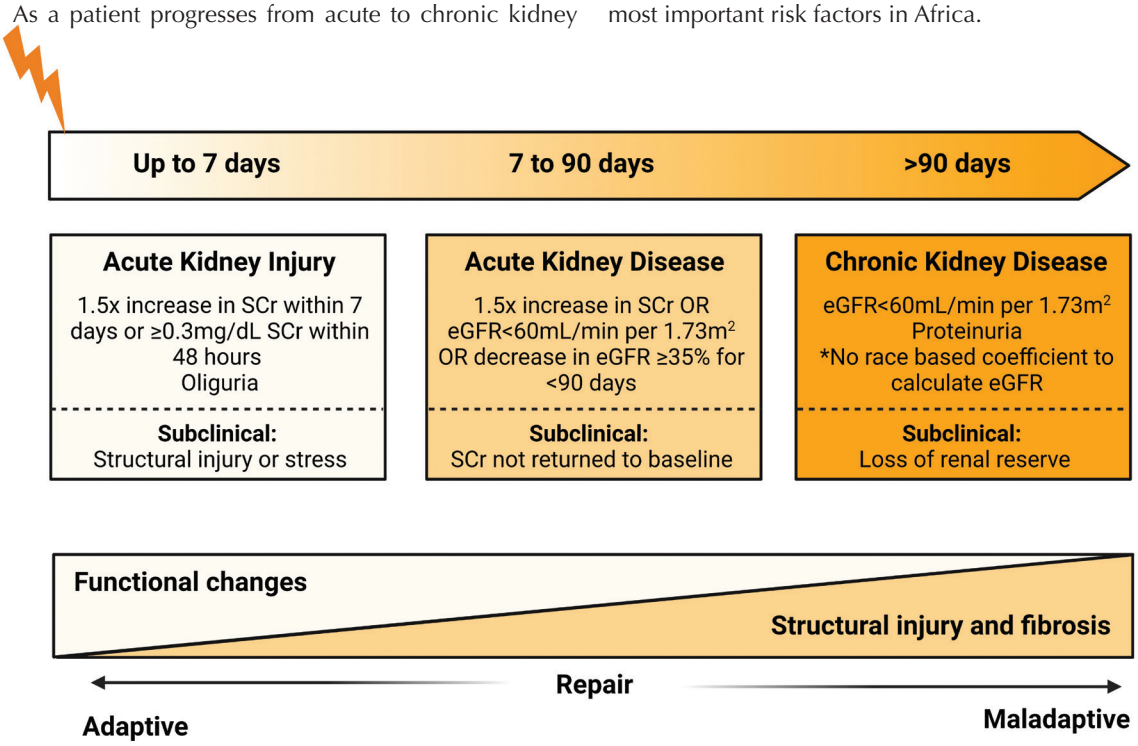

Figure 2. Definitions of acute and chronic kidney disease using the Kidney Disease: Improving Global Outcomes (KDIGO) criteria.

Diagnosis of Kidney Disease

Kidney disease is often asymptomatic until advanced stages of disease. Diagnosis relies on estimating the glomerular filtration rate and/or assessing urine for protein[5]. When detected early, kidney disease is often an incidental finding as part of routine investigations for other illnesses. Patients with kidney disease may present with diverse signs and symptoms including edema, hypertension, weakness, easy fatigability, anorexia, vomiting, pruritus, and, in advanced stages, encephalopathy or seizures. Radiological findings by ultrasound of small and echogenic kidneys supports a chronic cause, while multiple bilateral renal cysts can point to polycystic kidney disease depending on age. Other laboratory investigations in patients with kidney disease include urinalysis, complete blood counts to assess anemia, and serum chemistries to evaluate hyperkalemia, metabolic acidosis, hyperphosphatemia, hypocalcemia and elevated parathyroid hormones levels[5].

In patients with proteinuria of unknown cause, additional screening for systemic lupus erythematosus (SLE) and hypocomplementemia associated nephropathies may be warranted. By and large the diagnosis of glomerular disease will depend on a kidney biopsy which should be done safely under ultrasound guidance.

Diagnosis of kidney disease can follow the algorithm proposed in Figure 3.

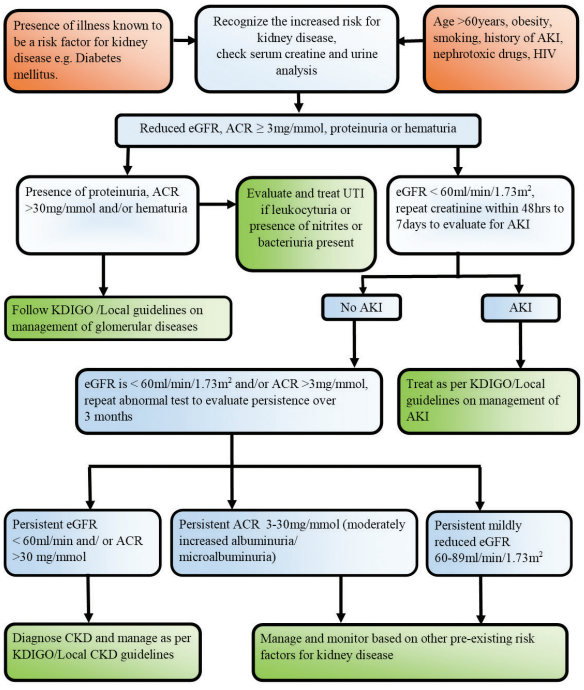

Figure 3: Proposed Algorithm for diagnosis of kidney disease

in Africa

Abbreviations: ACR-Albumin creatinine ratio; AKI-acute kidney injury; CKD-Chronic kidney disease; eGFR-estimated glomerular flirtation rate; HIV-Human Immunodeficiency Virus; KDIGO-Kidney Disease: Improving Global Outcomes; UTI-Urinary tract infection.

Key Concerns for Adults and Children

Delayed recognition of congenital abnormalities of the kidneys and urinary tract (CAKUT) can lead to progressive kidney injury that could be mitigated with early recognition and surgical correction. In addition, the burden of infections in children in Africa is high, particularly in malaria-endemic areas, where repeated infections leading to AKI or glomerulonephritis can lead to progressive loss of kidney function and earlier CKD onset. Common infectious causes of AKI include gastroenteritis, sepsis, malaria, pneumonia, and leptospirosis.

Among adults, the most well recognized risk factors for kidney disease include hypertension, diabetes, and obesity[5]. This can be further complicated by chronic infections including HIV, tuberculosis as well as obstetric complications. Although there have been gains in initiating antiretroviral therapy (ARVs) in people living with HIV[11], a significant proportion of people living with HIV lack access to ARVs and remain at risk of HIV-associated nephropathy.

In patients with established end stage kidney disease, the need for kidney replacement therapy is still a challenge. Access to dialysis is limited with dialysis available only in a few urban centers at a cost as this is not usually supported entirely by the public health system (Figure 1). Further, only 14 African countries conduct kidney transplants (Figure 1). Many countries do not have established kidney transplant programs and thus patients in need of transplant must travel to other countries to seek transplant services, making it not only expensive but limited access. For countries with existing transplant programs, most of these countries depend on living donors and lack programs for cadaveric kidneys, limiting the number of people who receive kidney transplants.

What is new and how has it affected practice and care of kidney disease

Over the past decade, there has been an increase in the number of nephrologists and dialysis centres across Africa (Figure 1). However, due to the concurrent rise in the population and increasing number of adults and children with kidney disease, access to nephrology care and services remains limited. Increasing industrialization of Africa is also increasing the exposures to environmental nephrotoxins and global changes in the climate are further impacting Africa through increased heat stress and climate disasters including landslides and flooding.

Early identification of kidney disease remains a key challenge in Africa due to limitations in diagnostics. Creatinine based diagnostics are affected by malnutrition and questions remain about the most appropriate eGFR equations among diverse African populations. Novel filtration biomarkers and point-of-care tests to identify structural injury to the kidney are promising but require validation in African populations and government investment will be needed to increase access[12].

Unlike AKI, CKD is not reversible, and all interventions are geared towards delaying disease progression to end-stage kidney disease (Table 1). Management is focused on appropriate control of causes of CKD such as good blood pressure control in patients with hypertension and blood sugar control in patients with diabetes mellitus[5]. The angiotensin-converting enzyme inhibitors (ACEIs) and angiotensin receptor blockers (ARBs) play a key role in controlling proteinuria and delaying progression of CKD, these drugs are available and relatively accessible even in low-income countries and thus need to be utilized in management of patients with kidney disease whenever required.

There is evidence that glycemic control as well as blood pressure control delay CKD progression and improve clinical outcomes. Newer medications for delaying CKD include sodium–glucose cotransporter-2 inhibitors (SGLT2i) and nonsteroidal mineralocorticoid receptor antagonists (MRA). SGLT2i have been found to delay CKD progression in type 2 diabetes[13] with evidence that they may be helpful even in those without diabetes mellitus[14]. MRA drugs even though novel in controlling progression of CKD in patients with diabetes mellitus, they require regular monitoring of hyperkalaemia[15,16]. The availability of MRA drugs in Africa and their need for regular and routine blood monitoring may be a challenge in low resource settings, however, they are important in instances where adequate monitoring is possible and when additional benefit is anticipated. As these are new drugs, their costs are still high and not affordable for most of the population in need.

Current management of kidney disease in Africa

Thus, conservative management of kidney disease will be the cornerstone of clinical management for most patients in Africa where a diet low in potassium and sodium, moderate protein intake, and regulated fluid intake is critical. There is no need to give up on our patients. Further, it is important to replace calcium levels with calcium supplements as well as replacement of 1,25 hydroxyvitamin D (calcitriol). Try to maintain a hemoglobin level of close to 11.5g/dl using iron supplements and erythropoiesis stimulating agents such as erythropoietin. If the patient is not a candidate for a kidney transplant, please ensure that the patient gets well matched blood transfusion when this is required. Among transplant candidates with evidence of heart failure or with a hemoglobin < 6g/dl, lymphocyte depleted blood transfusions may be lifesaving.

Always remember to manage patients holistically and in a multidisciplinary manner catering to their physical, social and spiritual wellbeing. If there is an opportunity to have a nutritionist, counsellor, social worker, psychologist, or other experts, please involve them in patient care.

Table 1. Summary of management of chronic kidney disease complications

Complication	Treatment	Rationale
Pediatric-specific considerations		
Failure to thrive	Recombinant human growth hormone (rhGH)	This can be initiated in children when food intake has been optimized and growth impairment persists. Other causes of growth impairment need to be address before initiation of rhGH such as CKD MBD, acidosis, anemia
Management of CKD complications		
Anemia	Iron supplements such as Irion sucrose	Oral iron is poorly absorbed and patients with CKD often have nausea, lack of appetite and a high pill burden. There are several forms of iron, please take note. Ensure that iron is infused slowly and also note that there is a risk of iron overload
	Erythropoietin	Replacement of low levels from the poorly functioning kidneys. Erythropoietin can be initiated when the hemoglobin level is <10g/dl with a target of 11-12g/dL
CKD mineral bone disorder		
Hypocalcemia	Calcium carbonate	Given orally on an empty stomach to raise calcium levels
	1, 25 dihydroxycholecalciferol (calcitriol) or 1 □ hydroxycholecaciferol (Alfacalcidol)	To increase absorption of calcium in the gut. May cause increased phosphate re-absorption; an unwanted effect
Hyperphosphatemia	Calcium carbonate, Calcium acetate	Given with meals to limit phosphate re-absorption Calcium based phosphate binders are best for patients with hypocalcemia
	Sevelamar	These phosphate binders are best for patients with hypercalcemia, as they do not alter serum calcium levels
Hyperparathyroidism	• 1, 25 dihydroxycholecalciferol (calcitriol) • Cinacalcet	This may be given in cases of uncontrolled secondary hyperparathyroidism or tertiary hyperparathyroidism
Acidosis	Sodium bicarbonate	This can be given as oral supplements to maintain normal levels in patients with serum bicarbonate levels <22mmol/L
Fluid overload	Diuretics including loop diuretics, thiazides	These are beneficial in management of fluid overload
General considerations		
Delaying CKD Progression	• RAAS Blockade • ARBs/ ACE-I such as Losartan, Enalapril, Lisinopril	• Slows progression of kidney disease. Controls blood pressure and slows proteinuria • Watch out for hyperkalemia and never combine ARB with ACE-I.
	SGL-2 inhibitors such as Dapagliflozin, Canagliflozin, Empagliflozin MRAs such as finerenone,	
	These drugs slow CKD progression especially in those with diabetes nephropathy	
	Statins	These may be important in patients with Dyslipidemia
	Lifestyle	Encourage physical exercise and avoid smoking
	Others- specific to primary/ comorbidity	Manage the underlying disease that may be contributing to CKD or increasing the risk of progression
Dietary advice		Lowering protein intake to 0.8 g/kg/day in adults with diabetes or those with eGFR <30 ml/min/ 1.73 m2. Optimize both protein and calorie intake in children to attain adequate growth Limit high potassium and high phosphate containing diet

Abbreviations: ACE-I Angiotensin converting enzyme inhibitors; ARBs-Aldosterone receptor blockers; CKD-MBD-Chronic Kidney Disease Mineral Bone Disease; eGFR- estimated glomerular filtration rate; MRAs- mineralocorticoid receptor antagonist; RAAS-Renin Angiotensin-Aldosterone System and SGL-2i-Sodium-glucose co-transporter-2 inhibitors.

Recommendations

Given the rising burden of kidney disease in Africa, its relative early age of onset and late presentation, there is an urgent need for tools to facilitate early recognition of kidney disease through expanded access to established and novel diagnostics.

There is need for concerted efforts to improve access to care for kidney disease through advocacy and political commitment while enhancing holistic approaches in care provision and support to those with kidney disease.

Newer treatments that slow progression of kidney disease are now available and these should be embraced by the African community.

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