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Communication

Epidemiological, Clinical, Outcome, and Prognostic Profile of Kidney Damage at the Charite Maternelle General Referral Hospital, Goma (DRC), 2016–2020: A Retrospective Descriptive Study

Edouard Karagi[1, *], Yabitsa Nantob[2], Amani Zaluka[2], Solange Yao[2], Mahougnon Aime Vinasse[2], Melikan Missike[2], Joseph Godonou[2], Eric Bakenga[3], Bonheur Furaha[1], Abel Kabagambe[1], Pascal Bigororande[2], Aime Kazigi[1, 3], Alex Munyakazi[1, 3], Rogatien Mwandjalulu[1, 3], Henri Chiza[1], Zacharie Tsongo[1, 3], Giovanna Zossoungbo[2], Seraphin Ahoui[4], Jacques Vigan[2]

[1]Department of Internal Medicine Charite Maternelle, University Hospital Center, Goma, Democratic Republic of the Congo

[2]National Teaching Hospital Center Hubert Koutoukou Maga, Cotonou, Benin

[3]University Hospital Centers of Goma-Kisangani, Goma-Kisangani, Democratic Republic of the Congo

[4]Departmental University Hospital Center Borgou-Alibori (CHUD-BA), Parakou, Benin

Abstract

Introduction: Acute kidney injury (AKI) and chronic kidney disease (CKD) represent a growing burden in sub-Saharan Africa, where local hospital-based data remain scarce. In the Democratic Republic of the Congo (DRC), no published study had previously described this profile at the Charite Maternelle University Hospital in Goma. *Objective:* To describe the epidemiological, clinical, therapeutic, outcome, and prognostic profile of kidney diseases in the Internal Medicine Department of the Charite Maternelle University Hospital in Goma between January 2016 and January 2020. *Methods:* This was a retrospective descriptive study including 60 hospitalized patients with a confirmed diagnosis of AKI or CKD, selected from 2,675 admissions to the Internal Medicine Department. Data were collected using a standardized form entered KoboCollect and analyzed with SPSS version 20. Qualitative variables were expressed as frequencies and percentages, while quantitative variables were presented as mean ± standard deviation or median [interquartile range], depending on their distribution. *Results:* Among 2,675 patients, 60 (2.24%) had kidney disease: 41 AKI (68.3%) and 19 CKD (31.7%). There was a male predominance (sex ratio 1.31; 56.7%). AKI occurred more frequently in patients under 40 years (46.3%), whereas CKD predominated in those aged 40–65 years (57.9%). Sepsis was the leading cause of AKI (51.2%), followed by hypovolemia (34.1%) and drug-induced nephrotoxicity (14.6%). Diabetes (57.9%) and hypertension (36.8%) were the main causes of CKD. Renal ultrasound abnormalities were found in 46.7% of cases. Only 26.3% of CKD patients received dialysis. Overall mortality in CKD was 21.1%. *Conclusion:* This study highlights the predominance of sepsis in AKI and the diabetes–hypertension combination in CKD, in a resource-limited setting with very restricted access to renal replacement therapy. It underscores the urgent need to improve early detection and management of cardiovascular and infectious risk factors.

*Correspondence: Edouard Karagi (edouardkaragi@gmail.com)

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Keywords

Acute Kidney Injury, Chronic Kidney Disease, Hospital-based Epidemiology, Sepsis, Sub-Saharan Africa, Democratic Republic of the Congo, Dialysis

1. Introduction

Acute and chronic kidney diseases represent a growing global public health challenge. According to the Global Burden of Disease Study 2019, chronic kidney disease (CKD) ranks among the top ten causes of death worldwide, with a 41.5% increase in attributable mortality between 1990 and 2019 [1]. It is estimated that approximately 850 million people worldwide are affected by some form of CKD twice the number of individuals living with diabetes [4].

Acute kidney injury (AKI), defined according to the 2012 KDIGO criteria as an increase in serum creatinine ≥ 26.5 µmol/L within 48 hours, or ≥ 1.5 times baseline within 7 days, or urine output < 0.5 mL/kg/h for more than 6 hours [14], affects approximately 13.3 million people annually and is responsible for 1.7 million deaths each year worldwide [3]. When associated with sepsis, in-hospital mortality may reach 40–60% in resource-limited settings [3, 6].

In sub-Saharan Africa, the ongoing epidemiological transition has created a double burden: persistent infectious causes (malaria, bacterial sepsis, HIV) coexist with the rapid emergence of non-communicable diseases such as diabetes and hypertension, which are now the leading causes of CKD on the continent [5].

However, the global distribution of kidney diseases is highly heterogeneous. Substantial differences exist between Africa, Europe, Asia, and the Americas in terms of epidemiological patterns, clinical presentation, underlying etiologies, access to treatment, and prognosis. In high-income countries, kidney diseases are predominantly driven by metabolic and vascular nephropathies, often diagnosed early due to well-structured healthcare systems. In contrast, in Africa and in parts of Asia and Latin America, kidney diseases are frequently diagnosed at advanced stages and remain strongly influenced by infectious diseases, environmental exposures, and inequalities in access to care [3, 9, 10].

Beyond biological differences, these disparities also reflect structural determinants, including access to diagnostic tools (renal biopsy, laboratory testing), availability of immunosuppressive therapies and renal replacement therapies, as well as the organization of healthcare systems. As a result, the prognosis of kidney diseases is often more strongly determined by socioeconomic context than by the intrinsic nature of the disease itself [5, 12].

The International Society of Nephrology (ISN) Global Kidney Health Atlas highlights that fewer than 20% of sub-Saharan African countries have national kidney registries, and that access to dialysis remains below 10 patients per million population in most countries [4].

In the Democratic Republic of the Congo (DRC), epidemiological data on kidney diseases remain extremely limited. Available literature is restricted to a few monocentric studies conducted in Kinshasa or Lubumbashi, which do not reflect the realities of conflict-affected or resource-constrained regions such as the eastern part of the country [5].

A comparative analysis of the epidemiological, clinical, therapeutic, outcome, and prognostic profiles of kidney diseases across different settings is essential to better understand the determinants of these disparities and to guide prevention and management strategies.

Study Objectives

The primary objective of this study was to describe the epidemiological, clinical, therapeutic, outcome, and prognostic profile of acute and chronic kidney diseases at the Charite Maternelle University Hospital in Goma over a four-year period. Secondary objectives were to identify the predominant etiologies of AKI and CKD and to determine factors associated with severe kidney disease and mortality.

2. Materials and Methods

2.1. Study Setting, Design, and Period

This was a retrospective, descriptive, and analytical study conducted in the Internal Medicine Department of the Charite Maternelle University Hospital in Goma, Democratic Republic of Congo. This facility is a tertiary-level general referral hospital serving the North Kivu region. It does not have a dedicated nephrology unit; patients with kidney diseases are managed by internists. The study period extended from January 1, 2016, to January 1, 2020, corresponding to a duration of four years.

2.2. Study Population and Selection Criteria

Source population:

All patients admitted to or followed in the Internal Medicine Department (inpatient or outpatient) during the study period.

Inclusion criteria:

1) Patients of any age, hospitalized or managed as outpatients at the Charite Maternelle University Hospital during the study period;

2) Patients with at least one renal function assessment (serum urea and creatinine) and a documented diagnosis of acute kidney injury (AKI) or chronic kidney disease (CKD) in the medical record.

Exclusion criteria:

Patients without evidence of kidney disease.

Non-inclusion criteria:

1) Absence of renal function tests in the medical record;
2) Untyped renal failure (AKI vs CKD not distinguished);
3) Incomplete medical records prevent extraction of variables of interest.

Operational definitions:

Acute kidney injury (AKI): defined according to KDIGO 2012 criteria [14] as an increase in serum creatinine ≥ 26.5 µmol/L (0.3 mg/dL) within 48 hours, or ≥ 1.5 times baseline within 7 days, or urine output < 0.5 mL/kg/h for ≥ 6 hours.

Chronic kidney disease (CKD): defined as abnormalities of kidney structure or function present for more than 3 months, with health implications (biological criterion: estimated glomerular filtration rate < 60 mL/min/1.73 m^2; structural criteria: albuminuria [albumin-to-creatinine ratio > 30 mg/g], urinary sediment abnormalities, electrolyte disturbances, or histological/morphological abnormalities), according to KDIGO guidelines [2].

2.3. Variables of Interest and Data Collection Procedures

The following variables were collected:

1) *Sociodemographic:* age (categorized as < 40, 40–65, > 65 years), sex;
2) *Clinical:* circumstances of diagnosis, presenting symptoms;
3) *Etiological:* primary cause of AKI or CKD;
4) *Paraclinical:* serum creatinine levels, renal ultrasound findings;
5) *Therapeutic:* treatments administered;
6) *Outcomes:* recovery, improvement, or death.

Data were collected retrospectively from archived medical records using a pre-established standardized data collection form and entered KoboCollect software.

2.4. Sampling Technique

A non-probability exhaustive sampling method was used: all patients meeting the inclusion criteria during the study period were included. No random sampling was performed, which constitutes an inherent limitation of the retrospective design.

2.5. Data Management and Storage

Data entered KoboCollect were exported to Microsoft Excel 2016 for cleaning and verification. Statistical analyses were performed using SPSS Statistics version 20 (IBM, Armonk, NY, USA). Patient anonymity was ensured by assigning a unique numerical code to each record.

2.6. Statistical Analysis Methods and Rationale

Descriptive statistics:

1) Qualitative variables were expressed as absolute frequencies and percentages;
2) Normally distributed quantitative variables were presented as mean ± standard deviation;
3) Non-normally distributed quantitative variables were presented as median and interquartile range [IQR].

Analytical statistics (assessment of associated factors):

1) Univariate logistic regression was used to identify variables associated with CKD versus AKI;
2) Results were expressed as odds ratios (ORs) with 95% confidence intervals (95% CI);
3) Statistical significance was set at $p < 0.05$.

Rationale for methodological choices: Binary logistic regression was selected due to the dichotomous nature of the primary dependent variable (CKD vs AKI). A univariate approach was preferred given the limited sample size (n = 60), which did not allow sufficient statistical power for a robust multivariate analysis (rule of at least 10 events per variable). This limitation is acknowledged and discussed.

2.7. Ethical Considerations

Written institutional authorization was obtained from the administration of the Charite Maternelle University Hospital. Patient anonymity was strictly maintained. In the absence of a formal institutional ethics committee at the time of the study, the principles of the Declaration of Helsinki were nevertheless adhered to.

3. Results

3.1. General Epidemiological Data

A total of 2, 675 patients were admitted to the Internal Medicine Department during the study period. Among them, 60 patients (2.24%) were included for kidney disease: 41 cases of acute kidney injury (AKI) (68.3%) and 19 cases of chronic kidney disease (CKD) (31.7%).

Table 1. *Kidney diseases among internal medicine admissions.*

Diagnosis	Number	Percentage (%)
Acute kidney injury (AKI)	41	1,53
Chronic kidney disease (CKD)	19	0,71
Other conditions	2 615	97,76
Total	2 675	100

Overall, among the 2,675 patients managed in the department, 41 (1.53%) had AKI, 19 (0.71%) had CKD, and 2,615 (97.76%) had other conditions.

3.2. Sociodemographic Characteristics

Patients' ages ranged from 18 to 75 years. A slight male predominance was observed (56.7%; male-to-female ratio = 1.31).

Table 2. Distribution by age and sex.

Age group	AKI (n=41)	%	CKD (n=19)	%
< 40 years	19	46,3	3	15,8
40–65 years	13	31,7	11	57,9
> 65 years	9	22,0	5	26,3
Total	41	100	19	100

Among AKI patients, those under 40 years were the most represented (46.3%), whereas CKD predominated in patients aged 40–65 years (57.9%).

Table 3. Distribution by the sex.

Sex	Number (n=60)	Percentage (%)
Male	34	56,7
Female	26	43,3
Total	60	100

Overall, males accounted for 56.7% of cases (n = 34) and females for 43.3% (n = 26).

3.3. Etiological Data

Table 4. Distribution of patients' bye etiology (AKI and CKD).

Etiology	Number	Percentage (%)
AKI (n = 41)		
Sepsis	21	51,2
Hypovolemia	14	34,1
Drug-induced nephrotoxicity	6	14,6
CKD (n = 19)		
Diabetes	11	57,9
Hypertension	7	36,8
HIV infection	1	5,3

Among AKI cases (n = 41), sepsis was the leading cause (51.2%), followed by hypovolemia (34.1%) and drug-induced nephrotoxicity (14.6%).

Among CKD cases (n = 19), diabetes was the main etiology (57.9%), followed by hypertension (36.8%) and HIV infection (5.3%).

3.4. Paraclinical Findings: Renal Ultrasound

Table 5. Renal ultrasound findings (n = 60).

Ultrasound result	Number	Percentage (%)
Normal kidney	32	53,3

Ultrasound result	Number	Percentage (%)
Abnormal kidney size and/or corticomedullary differentiation	19	31,7
Polycystic kidney disease	7	11,7
Solitary kidney	2	3,3
Total	60	100

Renal ultrasound was normal in 53.3% of cases (n = 32). Abnormal findings included alterations in kidney size and/or corticomedullary differentiation (31.7%), polycystic kidney disease (11.7%), and solitary kidney (3.3%).

3.5. Outcomes and Prognostic Data

Table 6. *Patient outcomes according to type of kidney disease.*

Outcomes	AKI n (%)	CKD n (%)	Total n	%
Recovery	34 (82,9)	0 (0)	34	56,7
Improvement	7 (17,1)	7 (36,8)	14	23,3
Death	0 (0)	4 (21,1)	4	6,7
Lost to followz-up or discharged against medical advice	0 (0)	8 (42,1)	8	13,3
Total	41 (100)	19 (100)	60	100

Among AKI patients, 82.9% recovered and 17.1% improved, with no recorded deaths.

Among CKD patients, 36.8% showed clinical improvement, 21.1% died, and 42.1% were lost to follow-up or discharged against medical advice. Overall outcomes were as follows: recovery (56.7%), improvement (23.3%), death (6.7%), and loss to follow-up (13.3%).

3.6. Analysis of Factors Associated with CKD (Univariate Analysis)

Table 7. *Univariate logistic regression identified several factors associated with CKD.*

Variable	CKD non n (%)	CKD yes n (%)	OR [IC 95%]	P
Sex male	23 (38,3)	34 (56,7)	1,08 [0,35–3,1]	0,9
Sex female	17 (28,3)	26 (43,3)	0,88 [0,52–1,78]	NC
Age < 40 years	13 (21,7)	23 (38,3)	4,56 [1,22-17,01]	0,02
Diabetes	1 (5,3)	11 (57,9)	54,2 [6,2–470,1]	<0,001
Hypertension	11(57,89)	7 (36,8)	5,37 [1,25–23,0]	0,02
HIV infection	NC	1 (5,26)	1,45 [1,15–1,83]	0,01
Sepsis	14 (34,1)	21 (51,2)	0,05 [0,006-0,39]	0,005

NC = not computable due to zero-frequency cells in the contingency table. This reflects a limitation of univariate analysis in the context of a small sample size

Sepsis was inversely associated with CKD (OR = 0.05; 95%

CI [0.006–0.39]; p = 0.005), reflecting its predominant association with AKI.

This retrospective study identified 60 cases of kidney disease (2.24%) among 2, 675 admissions over a four-year period. AKI accounted for 68.3% of cases, predominantly affecting younger adults (< 40 years), and was mainly caused by sepsis (51.2%). CKD accounted for 31.7% of cases, predominantly affecting individuals aged 40–65 years, and was mainly related to diabetes (57.9%) and hypertension (36.8%). Mortality among CKD patients was 21.1%, and only 26.3% had access to dialysis.

4. Discussion

The observed hospital prevalence (2.24%) is consistent with data reported from African internal medicine settings [5, 7], although it is likely underestimated due to strict exclusion criteria and the absence of systematic screening.

The predominance of sepsis as the leading cause of AKI (51.2%) aligns with international data. Hoste et al. [3] reported that 40–60% of hospital-acquired AKI in low-resource settings is septic in origin. In sub-Saharan Africa, infectious causes including bacteremia, severe malaria, and complicated urinary tract infections remain predominant [5]. In Goma, a context marked by prolonged armed conflict, limited healthcare access, and delayed diagnosis, sepsis significantly increases the risk of severe AKI. This contrasts with high-income settings, where AKI is more often postoperative or drug induced [3].

Diabetes (57.9%) and hypertension (36.8%) as leading causes of CKD reflect the ongoing epidemiological transition in Africa. The International Society of Nephrology identifies diabetes as the primary global driver of CKD progression [4], a trend confirmed by recent African data [4, 5, 7]. In the DRC, rising prevalence of these conditions combined with limited screening contributes to late-stage presentation.

These findings confirm marked intercontinental variability in CKD epidemiology. Although global prevalence is estimated at 10–13%, this average conceals substantial heterogeneity. Higher rates reported in Africa and Asia are influenced by underdiagnosis, lack of registries, and disparities in access to care rather than intrinsic biological differences [5].

In Africa, the absence of national registries and reliance on hospital-based studies result in underestimation of prevalence and overestimation of severity. This contrasts with Europe and North America, where population-based registries provide more accurate epidemiological assessments [3, 7, 10].

A key finding is the dual burden of disease: infectious diseases (HIV, malaria, tuberculosis) coexist with rapidly increasing non-communicable diseases such as diabetes and hypertension. This contributes to diverse etiologies and faster progression to end-stage kidney disease [1, 4].

In contrast, kidney diseases in high-income countries are predominantly driven by metabolic and vascular causes, although increasing diabetes and obesity suggest a rising burden even in these regions [6, 8].

Clinical differences across regions are largely explained by delayed diagnosis and limited healthcare access. In Africa, patients often present at advanced stages with established kidney failure, whereas early detection is more common in high-income settings [8, 10, 13].

Despite the existence of harmonized international guidelines such as KDIGO, their implementation remains uneven. Limited access to renal biopsy, immunosuppressive therapies, and renal replacement therapy constitutes a major barrier in low-resource settings, compounded by a shortage of nephrologists and financial constraints [2, 3, 10].

Conversely, high-income countries benefit from broader access to advanced treatments, including biologics and kidney transplantation, resulting in improved survival and quality of life [1, 5, 7].

Prognosis varies considerably across regions. Rates of progression to end-stage kidney disease and mortality are significantly higher in Africa, primarily due to delayed diagnosis and limited access to renal replacement therapy. In Europe and North America, access to dialysis and transplantation significantly improves survival [8, 10, 11].

In this study, only 26.3% of CKD patients received dialysis, far below international standards. The ISN Global Kidney Health Atlas reports that dialysis availability in sub-Saharan Africa is approximately 50 times lower than in Western Europe [4]. This limited access is a major determinant of the observed mortality rate (21.1%), consistent with published African data (20–40%) [7, 8].

The moderate male predominance (56.7%) and younger age of AKI patients reflect increased exposure of young men to infectious etiologies in this context, consistent with other African studies [5].

Overall, these findings support a dual strategy for nephroprotection in sub-Saharan Africa: (1) strengthening prevention and early management of infections to reduce septic AKI, and (2) improving control of diabetes and hypertension to slow CKD progression [2, 14].

5. Conclusion

These results highlight the urgent need to integrate kidney disease screening into routine care for patients with diabetes and hypertension at the primary healthcare level in the DRC. Early identification of CKD before stages 4–5, which accounted for 72.4% of cases in this study could significantly reduce mortality and the need for dialysis.

In addition, strengthening sepsis prevention and rational antibiotic use represents a key strategy to reduce the incidence of AKI.

To our knowledge, this study is among the few describing kidney disease profiles in the Goma region. It contributes to the limited African literature on kidney health in resource-constrained settings and provides baseline data for future provincial or national kidney registries in the DRC.

Abbreviations

AKI	Acute Kidney Injury
CKD	Chronic Kidney Disease
RDC	Democratic Republic of Congo
GBD	Global Burden of Disease
HIV	Human Immunodeficiency Virus
KDIGO	Kidney Disease Improving Global Outcomes
eGFR	Estimated Glomerular Filtration Rate
Ors	Odds Ratios
NC	Not Computable

Author Contributions

Edouard Karagi: Conceptualization, Resources, Data curation, Formal Analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Writing – original draft, Writing – review & editing

Yabitsa Nantob: Formal Analysis, Investigation, Resources, Software, Supervision, Validation, Writing – original draft

Amani Zaluka: Data curation, Writing – review & editing

Solange Yao: Data curation, Investigation

Mahougnon Aime Vinasse: Data curation, Investigation

Melikan Missike: Data curation, Investigation

Joseph Godonou: Data curation, Investigation

Eric Bakenga: Data curation, Writing – review & editing

Bonheur Furaha: Data curation, Writing – review & editing

Abel Kabagambe: Data curation, Writing – review & editing

Pascal Bigororande: Data curation, Writing – review & editing

Aime Kazigi: Supervision, Writing – original draft

Alex Munyakazi: Supervision, Writing – original draft

Rogatien Mwandjalulu: Supervision, Writing – original draft

Henri Chiza: Supervision, Writing – original draft

Zacharie Tsongo: Supervision, Writing – original draft

Giovanna Zossoungbo: Supervision, Writing – original draft

Seraphin Ahoui: Supervision, Writing – original draft

Jacques Vigan: Supervision, Writing – original draft

Conflicts of Interest

The authors declare no conflicts of interest.

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