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Epidemiology of Chronic Kidney Disease in the Nephrology and Hemodialysis Department of the Point G University Hospital Center, Bamako, Mali

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Abstract

Introduction: Chronic Kidney Disease (CKD) is a major global public health issue. The aim of this study was to determine the prevalence of CKD, establish its etiologies, and identify prognostic factors. **Methodology**: This was a prospective, descriptive study conducted over a one-year period from January 1 to December 31, 2022. It focused on patients hospitalized in the nephrology department at Point G University Hospital during the study period. Patients hospitalized for confirmed chronic kidney disease during the study period with a complete medical record and who gave their consent were included. **Results**: Of the 709 patients, 351 met our criteria, representing a hospital frequency of 49.5%. The average age was 38.09 ± 15.268 years, with extremes of 6 and 80 years. Males accounted for 58.1% of cases, with a sex ratio of 1.4. One in two patients had a low socioeconomic status, *i.e.*, 55.3% (194 cases). Upon admission, 81 patients (23.1%) had oligo-anuria. The presence of uremic frost and pericardial friction was noted in 17.4% and 6.6% of cases, respectively. Based on blood pressure, 239 patients (68.1%) were hypertensive versus 104 cases (29.63%) with normal blood pressure and 8 cases (2.27%) with arterial hypotension. The mean serum creatinine was 1439.53 ± 941.56 µmol/L. According to MDRD, CKD was stage 5 in 306 patients (87.2%). Ten patients (2.8%) had CKD without renal failure. In terms of bone mineral status, hypocalcemia and hyperphosphatemia were found in 88.98% of patients, com-

pared with 58% with vitamin D3 deficiency and 93% with hyperparathyroidism. Proteinuria was minimal in 49.8% of cases. On ultrasound, renal atrophy of less than 100 mm in the long axis was noted in 69.9% of patients with poor corticomedullary differentiation, and pyelocaliceal dilatation in 12.71% of cases. The initial nephropathy in patients was dominated by chronic vascular nephropathy 33.04% (116 cases), idiopathic CGN 21.08% (74) and chronic tubulo-interstitial nephropathy 11.68% (41 cases). The outcome was favorable in 233 patients (66.38%) compared with 48 deaths (13.68%), 53 lost to follow-up (15.1%), and 17 cases discharged against medical advice (4.84%). **Conclusion:** Chronic kidney disease is common and has a poor prognosis, especially in a context of limited resources. High blood pressure was identified as the main cause. Community programmes for the early detection of high blood pressure and chronic kidney disease need to be implemented in order to significantly reduce the incidence of chronic kidney disease.

Keywords

Chronic Kidney Disease, CRF, Nephrology, CHU Point G

1. Introduction

Chronic Kidney Disease (CKD) is a major global public health issue [1]. It is defined as the presence for more than three months of: renal failure and/or a morphological or histological renal abnormality, provided that it is "clinically significant", and/or an abnormality in the composition of the blood or urine secondary to renal impairment [2]. This definition includes not only Chronic Renal Failure (CRF), which is a reduction in Glomerular Filtration Rate (GFR) to less than 60 ml/min per 1.73 m^2, persisting for three months or more, but also renal damage with normal renal function [3]. As it progresses, CKD causes cardiovascular, hematological (anemia due to erythropoietin deficiency), mineral and bone (renal osteopathy), metabolic, and endocrine (secondary hyperparathyroidism) complications [4] [5].

The number of people with End-Stage Renal Disease (ESRD) requiring replacement therapy is increasing, with exorbitant treatment costs. In the United States, CKD stages 1 to 4 affect one in 10 adults, and in 2015 in France, the number of patients at the same stages was estimated at 3 million [6].

In France, the prevalence of CKD defined as an eGFR <60 ml/min/1.73m^2 was estimated at 1.5% using the CKD-EPI formula in adults aged 18 to 74, representing 1.6 million people in this population group [7].

The sub-Saharan Africa region is currently facing an epidemiological transition towards chronic noncommunicable diseases such as High Blood Pressure (HBP), diabetes, cardiovascular disease, and CKD. These conditions account for approximately 60% of overall mortality and affect all age groups, regardless of socioeconomic status or ethnicity [8].

In Burkina Faso, the crude incidence of CKD has increased over the past dec-

ade, from 0.080‰ in 2013 to 0.400‰ in 2022. In northern Senegal, the overall prevalence of CKD was 4.9% in 2014. In Congo, the prevalence of CKD in the adult population aged 20 and over was 12.4% in the capital Kinshasa [9]-[11].

In Mali, the available data are hospital-based. In 2023 at the Point G University Hospital, the prevalence of ESRD in the nephrology department was 45% and that of CKD was 10.67% in the internal medicine department [12] [13].

In the nephrology department of the Point G University Hospital, no study has been conducted on the prevalence of chronic kidney disease; hence the interest of this work, the aim of which was to determine the frequency of CKD and establish its etiologies in order to identify prognostic factors.

2. Methodology

This was a prospective, descriptive study conducted from January 1 to December 31, 2022, a period of one year. It focused on patients hospitalized in our department during the study period. Patients hospitalized for confirmed chronic kidney disease during the study period with a complete medical record and who gave their consent were included. Patients with acute kidney injury, unconfirmed CKD, incomplete medical records, or who did not give their consent were not included in this study.

Data collection: Each participant received a pre-established individual survey form that allowed us to collect the following data:

- Sociodemographic variables: age, gender, origin, ethnicity, nationality, marital status, and socioeconomic status.
- Reasons for hospitalization.
- Medical history and cardiovascular risk factors investigated included hypertension, diabetes, smoking, alcoholism, dyslipidemia, and the use of potentially nephrotoxic medications.
- Clinical signs were organized into uremic syndrome, which included digestive manifestations (uncontrollable vomiting, nausea, anorexia, gastroparesis), neurological manifestations (apathy, attention deficit, restless legs, asthenia, confusion, coma, insomnia, plantar heat; asterixis; uremic encephalopathy; memory disorders; convulsions; tinnitus; phosphenes; confusion; flapping tremor; muscle fatigue; cramps; impotence; polyneuritis; irritability; headaches), hematological manifestations (epistaxis; hematemesis; bleeding tendency), cardiovascular manifestations (pericardial friction rub; chest pain, pleural effusion, tamponade), skin manifestations (uremic frost; dry skin; pruritus), pulmonary signs (cough; dyspnea; pleurisy, hemoptysis).

In terms of nutrition, significant weight loss or even malnutrition were investigated. Urinary signs investigated included anuria, oliguria, pollakiuria, pyuria, dysuria, nocturia, burning during urination, and hematuria.

Clinical data included reasons for hospitalization, blood pressure in mm Hg on admission (classified according to World Health Organization guidelines), heart rate, presence or absence of conjunctival and/or palmar-plantar pallor, and blood

volume status. Signs of Acute Pulmonary Edema (APE), hypertensive encephalopathy, and neurological focus were also investigated. All patients seen during the study underwent a thorough and comprehensive clinical examination.

- To make serum creatinine a specific marker of renal function, we used the Modification of Diet in Renal Disease (MDRD) equation to estimate the GFR in our patients with Chronic Renal Failure (CRF). Other additional tests included plasma urea, complete blood count, blood ionogram, calcium, glucose, lipid profile, 24-hour proteinuria, and urine cytology and bacteriology (ECBU). Ultrasound was performed to assess the size and echotexture of the kidneys. In cases of renal cavity dilatation, this was supplemented by urography and angiography. Cardiac abnormalities were assessed by frontal chest X-ray, Electrocardiogram (ECG), and cardiac ultrasound.
- The management of CKD focused on several areas, namely: lifestyle and dietary guidelines, medical and surgical treatment, and hemodialysis.

Data entry and analysis: The variables were entered into an epidemiological analysis tool, SPSS version 27.0. Arithmetic means were calculated with an α-1.96 risk and $p < 0.05$. Data entry and word processing were performed using Word and Excel 15.0.

Operational definitions:

Socioeconomic status: It was defined as low for patients who were uneducated and unemployed or had low incomes, medium for patients who were educated or uneducated but had sufficient income to cover their medical care over a given period, and high for patients who were educated or uneducated but had a good income that could cover their medical care over a long period without difficulty.

The guaranteed minimum wage (SMIG) is 40,000 CFA francs per month (70.36 USD) and 230.77 CFA francs per hour (0.41 USD), since its increase in 2016. This amount was set by Decree No. 2015-0363-P-RM of 19 May 2015.

Chronic Kidney Disease: The chronic nature of renal failure was considered to be present when the following criteria had been present for more than three months: (history of high creatinine levels, known general illnesses), morphological criteria (decrease in kidney size < 100 mm on renal ultrasound), and biological criteria (hypercreatininemia with GFR < 60 ml/min, normochromic normocytic aregenerative anemia, hypocalcemia). CKD has been classified into 5 stages according to the KDIGO (Kidney Disease Improving Global Outcomes) classification (Table 1).

Table 1. Stages of chronic kidney disease based on GFR [5].

Stages	Description	DFG (ml/min/1.73m²)
1	Chronic kidney disease with normal kidney function	≥90
2	Chronic kidney disease with mild kidney failure	60 - 89
3A	Mild to moderate kidney failure	45 - 59
3B	Moderate to severe kidney failure	30 - 44
4	Severe kidney failure	15 - 29
5	End-stage kidney failure	<15

Chronic glomerulonephritis was defined as significant glomerular proteinuria (>1 g/24hours) with or without edema, hypertension, hematuria, or renal failure.

Chronic tubulointerstitial nephropathy was defined as leukocyturia, tubular proteinuria < 1 g/24hours, normal-sized, reduced or enlarged kidneys, obstructive or non-obstructive renal failure, dilated or non-dilated pyelocaliceal cavities, and kidneys with normal or irregular contours.

Chronic vascular nephropathy was associated with long-standing hypertension, concentric LVH, 24-hour proteinuria < 1.5 g/24hours, hypertensive retinopathy, and normal urinary sediment.

Diabetic Kidney Disease was defined as the onset of renal failure in patients with type 1 or type 2 diabetes, associated with diabetic retinopathy, pathological proteinuria ranging from microalbuminuria to proteinuria > 500 mg/24hours, and/or hypertension.

Hereditary nephropathy (polycystic kidney disease) was suspected in the presence of large kidneys with multiple cysts on ultrasound, with a positive family history.

Abnormalities in urine output were defined as anuria (urine output less than 100 ml/24hours), oliguria (urine output less than 400 ml/24hours), and polyuria (urine output greater than 3 liters/24hours) [4] [5].

Anemia was defined as hemoglobin < 12 g/dl, and considered severe for hemoglobin < 8 g/dl. Patients already known to be diabetic and/or those whose diagnosis of diabetes was confirmed during hospitalization with a fasting blood glucose level > 1.26 g/l in at least two successive tests were considered diabetic [14].

The standards for other biological tests were those of the various accredited medical laboratories in the city of Bamako.

Hypertensive encephalopathy was suspected in cases of severe BP increase associated with the rapid onset of neurological symptoms (severe headaches with nausea and vomiting, epileptic seizures, visual disturbances, confusion, and drowsiness). The diagnosis of stroke was confirmed by the results of a brain scan [15].

Electrical Left Ventricular Hypertrophy (LVH) was defined based on a Sokolow-Lyon index > 35 mm. Cardiomegaly was diagnosed based on a cardiothoracic index > 0.50 on chest X-ray.

Hypertensive Retinopathy (HR) was classified according to Kirkendall into three stages (stage I: severe and widespread arterial narrowing, stage II: hemorrhages and/or exudates, stage III: dysoric nodules/papillary edema) [16].

Uremic syndrome was suspected in light of a constellation of clinical and biological abnormalities, namely: humoral abnormalities, with delayed clinical and visceral consequences (nitrogen retention, hyperkalemia, hyperhydration, metabolic acidosis, hypocalcemia, hyperphosphatemia), normocytic normochromic anemia (delayed, except in cases of hemorrhage or hemolysis), thrombopathy and bleeding tendency, hypercoagulability, and thrombotic tendency.

Hemodialysis was traditionally indicated as an emergency measure in cases

of severe hyperkalemia ≥ 7.5 mmol/L refractory to drug treatment according to ECG; clinical metabolic acidosis with inadequate ventilatory compensation and no margin for correction with bicarbonate in cases of hypervolemia; OAP refractory to diuretic treatment; uremic syndrome with encephalopathy (confusion, asterixis, etc.) or pericardial friction [16] [17].

Patient outcomes were considered favorable if there was improvement in clinical signs and/or stabilization of biological signs, and unfavorable if there was worsening of clinical and biological signs and/or death. Patients not seen after discharge were considered lost to follow-up.

3. Results

Of the 709 patients, 351 met our criteria, representing a hospital frequency of 49.5%. The mean age was 38.09 ± 15.268 years, with extremes of 6 and 80 years. Males accounted for 58.1% of cases, with a sex ratio of 1.4 men to 1 woman (Table 2). One in two patients had a low socioeconomic status (55.3%, or 194 cases), with housewives accounting for 30.2% (106 cases). The majority of patients came from Bamako, the capital of Mali (85.1%, or 299 cases). A history of hypertension was found in 59.8% of patients (210 cases) versus 5.7% with diabetes (20 cases). Elevated plasma creatinine levels were the main reason for consultation in 88.6% of cases.

The most common general symptoms were physical asthenia, anorexia, and fever, occurring in 84.1%, 66.7%, and 45.9% of cases, respectively. The functional signs were dominated by vomiting (64.1%), headaches (59.3%), and exertional dyspnea (52.4%). Physical examination revealed conjunctival pallor in 77.8% of patients (Table 3). Other physical signs were dominated by lower limb edema (54.4%) and extracellular dehydration (30.8%). On admission, 81 patients (23.1%) had oligoanuria. Uremic frost and pericardial friction were noted in 17.4% and 6.6% of cases, respectively. Based on blood pressure, 239 patients (68.1%) were hypertensive versus 104 cases (29.63%) with normal blood pressure and 8 cases (2.27%) with arterial hypotension. According to the WHO classification of hypertension, grade 1 accounted for 16.2%, grade 2 for 29.3%, and grade 3 for 22.2%, with the majority being systolic-diastolic type (89.54%).

The mean serum creatinine was 1439.53 ± 941.56 µmol/L. According to MDRD, CKD was stage 5 in 306 patients (87.2%). Ten patients (2.8%) had CKD without renal failure. These included six cases of isolated proteinuria and/or proteinuria associated with nephrotic syndrome, and four cases of polycystic kidney disease. The classification of CKD is summarised in Table 4. The mean blood urea nitrogen level was 30.16 ± 14.4 mmol/L. The mean hemoglobin level was 8.93 ± 2.5. One in two patients had severe anemia with a hemoglobin level of 6 - 8 g/dL in 58.11% of cases. Anemia was normocytic normochromic in 61.8% of cases and anemia in 78.83% of cases. Blood ionograms showed hyponatremia and hyperkalemia in 64.75% and 37.42% of cases, respectively. In terms of bone and mineral metabolism, hypocalcemia and hyperphosphatemia were found in 88.98% of pa-

tients, compared with 58% with vitamin D3 deficiency and 93% with hyperparathyroidism. Proteinuria was minimal in 49.8% of cases. In urine culture (N = 238), leukocyturia and hematuria were found in 50.8% and 19.1% of cases, respectively. Urine culture was positive in 100 patients (42.01%), with Escherichia coli as the predominant germ in 50% of cases.

On ultrasound, renal atrophy < 100 mm in the long axis was noted in 69.9% of patients with poor corticomedullary differentiation. Pyelocaliceal dilatation was present in 12.71% of cases.

With regard to cardiovascular complications, left ventricular hypertrophy was found in 60.58% of patients on ECG, and dilated cardiomyopathy in 21.64% on cardiac Doppler ultrasound. Hypertensive retinopathy was noted in 46.75% (72 cases) of cases versus 2.6% (4 cases) of diabetic retinopathy.

Initial nephropathy was dominated by chronic vascular nephropathy 116 cases (33.04%), idiopathic CGN 74 cases (21.08%), and chronic tubulointerstitial nephropathy 41 cases (11.68%) (Table 5).

From a therapeutic standpoint, in terms of lifestyle and dietary measures, all patients were advised to stop smoking and drinking alcohol. Sodium restriction was prescribed for 67.8% of patients. Anemia was managed by red blood cell transfusion (30.16%), 100 mg injectable iron supplementation (30.16%), and erythropoietin (3.9%). Patients were on antihypertensive drugs in 74.64% of cases. Calcium and cholecalciferol supplementation was given in 81.19% and 29.05% of cases, respectively.

Table 2. Distribution of patients according to socio-economic data.

Socio-demographic data		Staff numbers (%)
Sexes	Male	204 (58.1)
	Feminine	147 (41.9)
Age group in years	0 - 20	49 (13.96)
	21 - 40	155 (44.18)
	41 - 60	125 (35.6)
	61 and more	22 (6.26)
Socio-economic status	Low	194 (55.3)
	average	146 (41.6)
	High	11 (3.1)

Table 3. Clinical data of patients.

Clinical data		Staff numbers (%)
Background	High blood pressure	210 (59.8)
	Oedema of the lower limbs	139 (39.6)
	Diabetes	20 (5.7)
	Stroke	11 (3.1)
	Kidney failure	4 (1.1)

Continued

Reasons for consultation	**Hypercreatininemia**	**311 (88.6)**
	Kidney damage on an ultrasound scan	19 (5.4)
	Proteinuria	10 (2.8)
	Oedematous syndrome	9 (2.6)
	Anuria	2 (0.6)
General signs	Astheniq	296 (84.14)
	Anorexia	234 (66.7)
	Fever	161 (45.9)
Functional signs	Headaches	208 (59.3)
	Nausea	228 (65)
	Vertigo	225 (64.1)
	Vomiting	225 (64.1)
	Exertional dyspnoea	184 (52.4)

Table 4. Distribution according to stage of CKD.

Stage of chronic kidney disease	Staff numbers	Percentage
Stage 1	10	2.8
Stage 2	7	2
Stage 3A	4	1.1
Stage 3B	8	2.3
Stage 4	16	4.6
Stage 5	306	87.2
Total	**351**	**100**

Table 5. Distribution of patients according to initial nephropathy.

Kidney disease	Staff numbers	Percentage
CVN	**116**	**33.04**
CIGN	74	21.08
CTIN	41	11.68
Nephrotic syndrome	17	4.84
HIVAN	11	3.13
Diabetic nephropathy	10	2.84
ADPKD	9	2.56
Lupus nephritis	3	0.90
Sickle cell nephropathy	2	0.56
Undetermined	68	19.37
Total	**351**	**100**

CVN: Chronic Vascular Nephropathy; **CIGN:** Chronic Idiopathic Glomerulonephritis; **CTIN:** Chronic Tubulo-Interstitial Nephropathy; **HIVAN:** HIV Associated Nephropathy; **ADPKD:** Autosomal Dominant Polycystic Kidney Disease.

The outcome was favorable in 233 patients (66.38%) compared with 48 deaths (13.68%), 53 lost to follow-up (15.1%), and 17 cases of discharge against medical advice (4.84%) (Table 6). The causes of death were severe sepsis (25 cases), hyperkalaemia (9 cases), Acute Pulmonary Oedema (APO) (6 cases), severe anaemia (5 cases), and undetermined (3 cases), and constituted factors for poor prognosis.

Hemodialysis was performed in 204 patients. The main indications were uremic syndrome in 135 cases (66.17%), hyperkalemia in 37 cases (18.14%), and acute pulmonary edema in 15 cases (7.35%) (Table 7).

Table 6. Breakdown by change.

Evolution	Staff numbers	Percentage
Favourable	**233**	**66.38**
Lost sight of	53	15.1
Death	48	13.68
Discharge against medical advice	17	4.84
Total	351	100

Table 7. Distribution according to haemodialysis treatment and indication.

		Effectifs (%)
Haemodialysis treatment	Yes	204 (58.2)
	No	147 (41.8)
Indication for haemodialysis	Uraemic syndrome	135 (66.17)
	Hyperkalaemia	37 (18.14)
	Acute pulmonary oedema	15 (7.35)
	Anuria	11 (5.40)
	Severe metabolic acidosis	6 (2.94)

4. Discussion

From January 1 to December 31, 2022, 709 patients were hospitalized in the nephrology and hemodialysis department of the Point G University Hospital, of whom 351 patients met the inclusion criteria for our study, representing a hospitalization rate of 49.50% of cases. According to the results of certain studies conducted at the Point G University Hospital, the prevalence of CRF was 45% in the nephrology department and that of CKD was 10.67% in the internal medicine department [12] [13]. This difference could be explained by the fact that our study was conducted in the nephrology department. To date, there are no comprehensive national data on the frequency of CRF in Mali. The data available mainly concern hospital prevalence rates, which cannot be extrapolated to the general population.

CKD was, in order of frequency: ESRD (95.16%); proteinuria (3.7%) and morphological abnormalities of the kidneys (1.4%). In the first region of Mali, at the Fousseyni Daou Hospital in Kayes, CKD was, in order of frequency: ESRD (51%);

proteinuria (16%), and morphological abnormalities of the kidneys (2%) [18]. In sub-Saharan Africa, the prevalence of CKD varies from one country to another. It was 30.2% in Côte d'Ivoire, 20% in Ghana and Nigeria, and 12.4% in Congo Kinshasa [19].

In the United States, the prevalence of CKD rose from 10% in the 1988 - 1994 series to 13.1% between 1999 - 2004 [20]. In India and China during the last decade, the prevalence of CKD was 17.2% and 10.8%, respectively [21] [22]. The high prevalence of CKD in our African region could be explained by the low socioeconomic status of the majority of these patients on the one hand, and the epidemiological transition towards chronic diseases on the other.

The average age of our patients was 38.09 ± 15.268 years, with extremes of 6 and 80 years. The 21 - 40 age group was the most common, accounting for 44.18% of cases. These results were identical to those previously found in Mali, with an average age of 40.09 and 42.25 ± 10 in 2021 and 2023, respectively [23] [24]. In Côte d'Ivoire, 64.3% of patients were aged between 25 and 45, and in Congo Kinshasa, 12.4% of cases were aged 20 and over [11] [25].

In Africa, and more specifically in Mali, chronic kidney disease affects young working adults more frequently, whereas in developed countries, more than half of patients are over 60 years of age. This difference can be explained by the fact that the population of developed countries is predominantly aging and that hypertension is common in our context among young people with kidney complications [26] [27]. In Europe, the prevalence of CKD increases with age. End-Stage Renal Disease (ESRD) is now 40 times more common in people over 60 than in the younger population [28]. In our study, 6.26% of patients were over 60 years of age and 180 patients (88.2%) aged 6 to 40 had end-stage renal disease.

Men seem to be more predisposed to chronic kidney disease than women. In our study, men accounted for 58.1% of cases compared to 41.9% of women, with a sex ratio of 1.4. Several other studies on CRF in Mali and Africa have confirmed this finding [12] [29] [30]. To explain this male predominance in CKD, some researchers have suggested that kidney function declines more rapidly in men because they accumulate more classic risk factors and have a more risky lifestyle. However, the main hypothesis is that estrogen has a renoprotective effect, partly due to its antifibrolytic properties, its vasodilatory effect, and its stimulation of tubular proliferation [31].

The low-income social class was the most affected by chronic kidney disease, accounting for 55.3% of cases, with housewives representing 30.2% (106 cases). Djibo and Kamissoko also had the majority of patients with low socioeconomic status [12] [18]. The disproportionate impact on this socioeconomic group could be explained, on the one hand, by their low income and illiteracy in this environment, but also by insufficient health coverage. This would be a likely reason for these subjects' frequent use of potentially nephrotoxic drugs and herbal medicine, which promotes CKD.

In our study, the main reason for hospitalization was elevated plasma creatinine

in 88.6% of cases. Over the past five years, studies conducted on CRF at the Point G University Hospital nephrology department in Kayes and Sikasso found that renal failure was the main reason for consultation in 97.9%, 89.6%, and 92.4% of cases, respectively [12] [18] [24].

Renal failure as the primary reason for hospitalization can be explained by the fact that elevated plasma creatinine levels prompt practitioners to refer patients to the nephrology department for better care.

The clinical manifestations were, in order of frequency: physical asthenia (84.14%); conjunctival pallor (77.8%); nausea (65%); headaches (59.3%); and exertional dyspnea (52.4%). At the Point G University Hospital, in the internal medicine department, SEGNIAGBETO found clinical symptoms dominated by asthenia, weight loss, and lower limb edema in 82.9%, 58.5%, and 41.5% of cases, respectively [13]. The polymorphism of these manifestations can be explained by the late treatment of patients, most of whom arrive at the terminal stage, which accounted for 87.2% of cases in this study.

Biologically, the complications of CRF were marked by the severity of uremia (mean azotemia 30.16 ± 14.14 mmol/L); anemia (mean hemoglobin level 8.93 g/dL); and calcium-phosphorus disorders such as hypocalcemia (88.98%), hyperphosphatemia (86.35%), hyperparathyroidism (93.64%), and hypovitaminosis D3 (79.9%). These findings are consistent with several studies conducted in Mali [12] [13] [18] and elsewhere in Sub-Saharan Africa [9] [11] [19]. Illiteracy, late referral of patients, and the low socioeconomic status of the majority of the population are obstacles to the proper management of chronic kidney disease.

Proteinuria is a marker of early kidney damage and a factor in the progression of kidney disease. In our study, proteinuria was significant in 231 patients, or 95.06% of cases, with a mean value of 4.25 ± 13.23 g/24h. Using a combination of clinical and paraclinical evidence, we identified the etiologies of chronic kidney disease in our patients. These included nephroangiosclerosis, idiopathic chronic glomerulonephritis, indeterminate nephropathy, diabetic nephropathy, and polycystic kidney disease in 34.04%, 21.08%, 19.37%, 2.84%, and 2.56% of cases, respectively. In 2022, in the same department, the causes of chronic renal failure were mainly nephroangiosclerosis (49.1%), idiopathic chronic glomerulonephritis (30.2%), diabetic nephropathy (8.1%), and chronic tubulointerstitial nephropathy (7.5%) [12]. Ten years ago, chronic glomerulonephritis was the most common cause (34.8%), followed by vascular nephropathy (28.4%) and chronic interstitial nephritis (15.5%) [29]. In Côte d'Ivoire, the etiologies were nephroangiosclerosis (25.3%), HIVAN (17%), and chronic tubulointerstitial nephritis (10.3%) of cases [32]. In France, the causes of CRF are related to glomerular nephropathy (23.1%), vascular nephropathy (20%), and diabetic nephropathy (17.1%) [33]. This difference can be explained by the high frequency of high blood pressure among black Africans.

In terms of treatment, in our study, all our patients followed a healthy diet. Drug treatment consisted mainly of antibiotics (82.9%), calcium carbonate (81.19%),

antihypertensive drugs (74.64%), and diuretics (53.44%) in cases. More than half of the patients were on hemodialysis, representing 58.2% of cases. The indications for dialysis were poorly tolerated uremia (66.17%), hyperkalemia (18.14%), acute pulmonary edema (7.35%), total anuria (5.40%), and metabolic acidosis (2.94%). The high frequency of dialysis could be explained by the fact that most of our patients came for consultation at the terminal stage of chronic kidney disease. The outcome was favorable in 66.38% of our patients.

In multivariate analysis, there was no statistically significant relationship between CKD stage 5 and gender, age, or low socioeconomic status of patients (Table 8).

Table 8. Relationship between stage 5CKD, gender, age, and low socioeconomic status.

		Stage 5 chronic kidney disease		P value
		Yes	No	
Gender	Male	178 (87.3%)	26 (12.7%)	0.96
	Female	128 (87.1%)	19 (12.9%)	
Age group	6 to 40 years	180 (88.2%)	24 (11.8%)	0.48
	41 and over	126 (85.7%)	21 (14.3%)	
Low socioeconomic status	Yes	131 (84.5%)	24 (15.5%)	0.19
	No	174 (89.2%)	21 (10.8%)	

Limitations of the study: This study highlighted the epidemiological and clinical aspects of CKD in our patients. However, it had certain limitations, as the aetiological diagnosis of CKD was often difficult without pathological examination. Renal biopsy was not performed. The high cost of additional blood, urine and morphological tests made it difficult to carry out the requested analyses.

Thus, the limitations of paraclinical investigation methods prevented us from identifying the precise aetiological factors. In this regard, there is a need for advocacy for the implementation of insurance for chronic non-communicable diseases available to the entire population.

5. Conclusion

Our study shows that chronic kidney disease is common and has a poor prognosis, especially in a context of limited resources. Most patients were already consulting at the terminal stage of the disease. It predominantly affects young, socially active adults with low levels of education and socio-economic status. High blood pressure was identified as the main cause. The implementation of community-based programmes for the early detection of high blood pressure and chronic kidney disease is an absolute necessity in order to significantly reduce the high incidence of chronic kidney failure.

Ethical considerations

Data confidentiality was respected, and the results of this study were used for sci-

entific purposes only.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Stevens, P.E., Ahmed, S.B., Carrero, J.J., Foster, B., Francis, A., Hall, R.K., *et al.* (2024) KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. *Kidney International*, **105**, S117-S314. https://doi.org/10.1016/j.kint.2023.10.018

[2] Krummel, T., Bazin, D., Faller, A.L. and Hannedouche, T. (2011) Diagnostic, facteurs de risque et traitement de l'insuffisance rénale chronique de l'adulte. *EMC Néphrologie*, **23**, 1-15. https://doi.org/10.1016/s1762-0945(11)38514-2

[3] National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (NKF-KDOQI) (2002) Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification. *American Journal of Kidney Diseases*, **39**, S1-S266.

[4] Thervet, E. (2017) Traité de Néphrologie. Lavoisier.

[5] Moulin, B. and Peraldi, M.N. **(2014)** Néphrologie. 6ième Édition, Ellipses.

[6] Frimat, L. and Ayav, C. (2018) Epidemiologie des maladies renales chroniques. *EMC-Nephrologie*, **15**, 1-15.

[7] Olié, V., Cheddani, L., Stengel, B., Gabet, A., Grave, C., Blacher, J., *et al.* (2021) Prévalence de la maladie rénale chronique en France, Esteban 2014-2016. *Néphrologie & Thérapeutique*, **17**, 526-531. https://doi.org/10.1016/j.nephro.2021.05.006

[8] Bax, L., Algra, A., Mali, W.P.T.M., Edlinger, M., Beutler, J.J. and van der Graaf, Y. (2008) Renal Function as a Risk Indicator for Cardiovascular Events in 3216 Patients with Manifest Arterial Disease. *Atherosclerosis*, **200**, 184-190. https://doi.org/10.1016/j.atherosclerosis.2007.12.006

[9] Millogo, O., Ouedraogo, A., Traore, N., Doro, H. and Rouamba, T. (2024) Risque d'insuffisance rénale chronique au Burkina Faso, analyse spatio-temporelle de 2013 à 2022. *Science et Technique, Sciences de la Santé*, **47**, 133-153.

[10] Seck, S., Ka, F. and Cisse, M. (2004) Enquête de prévalence de la maladie rénale chronique dans la région Nord du Sénégal. *Néphrologie & Thérapeutique*, **10**, 399. https://doi.org/10.1016/j.nephro.2014.07.128

[11] Sumaili, E.K., Krzesinski, J., Cohen, E.P. and Nseka, N.M. (2010) Épidémiologie de la maladie rénale chronique en République démocratique du Congo: Une revue synthétique des études de Kinshasa, la capitale. *Néphrologie & Thérapeutique*, **6**, 232-239. https://doi.org/10.1016/j.nephro.2010.03.008

[12] Djibo, B. (2023) Insuffisance rénale chronique: Aspects épidémio-cliniques, étiologiques et thérapeutiques dans le service de néphrologie et d'hémodialyse du CHU du Point G. Thèse, University of Sciences, Techniques and Technologies of Bamako.

[13] Segniagbeto, M.M. (2023) Caracteristiques de la Maladie Rénale chronique dans le service de médecine interne du chu du point G. Thèse, University of Sciences, Techniques and Technologies of Bamako.

[14] American Diabetes Association (2015) Classification and Diagnosis of Diabetes. *Diabetes Care*, **38**, 8-16.

[15] Vaughan, C.J. and Delanty, N. (2000) Hypertensive Emergencies. *The Lancet*, **356**,

411-417. https://doi.org/10.1016/s0140-6736(00)02539-3

[16] Amraoui, F., Bos, S., Vogt, L. and van den Born, B. (2012) Long-Term Renal Outcome in Patients with Malignant Hypertension: A Retrospective Cohort Study. *BMC Nephrology*, **13**, Article No. 71. https://doi.org/10.1186/1471-2369-13-71

[17] Favre, N., Burnier, M. and Kissling, S. (2016) Quand appeler le néphrologue aux urgences? *Revue Médicale Suisse*, **12**, 398-403. https://doi.org/10.53738/revmed.2016.12.507.0398

[18] Kamissoko, F. (2023) Insuffisance rénale chronique: Profil épidémio-clinique et para clinique à l'unité de néphrologie de l'hôpital Fousseyni DAO de Kayes. Thèse, University of Sciences, Techniques and Technologies of Bamako.

[19] Stanifer, J.W., Jing, B., Tolan, S., Helmke, N., Mukerjee, R., Naicker, S., *et al*. (2014) The Epidemiology of Chronic Kidney Disease in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. *The Lancet Global Health*, **2**, e174-e181. https://doi.org/10.1016/s2214-109x(14)70002-6

[20] Coresh, J., Selvin, E., Stevens, L.A., Manzi, J., Kusek, J.W., Eggers, P., *et al*. (2007) Prevalence of Chronic Kidney Disease in the United States. *Journal of the American Medical Association*, **298**, 2038-2047. https://doi.org/10.1001/jama.298.17.2038

[21] Singh, A.K., Farag, Y.M.K. and Mittal, B.V. (2013) Epidemiology and Risk Factors of Chronic Kidney Disease in India Resultats from the SEEK (Screeming and Early Evaluation of Kidney Disease) Study. *BMC Nephrology*, **14**, Article No. 114.

[22] Zhang, L., Wang, F., Wang, L., Wang, W., Liu, B., Liu, J., *et al*. (2012) Prevalence of Chronic Kidney Disease in China: A Cross-Sectional Survey. *The Lancet*, **379**, 815-822. https://doi.org/10.1016/s0140-6736(12)60033-6

[23] Samaké, M., Sy, S., Coulibaly, M., *et al*. (2021) Prévalence de la maladie rénale au service des urgences de l'hôpital Fousseyni Daou de Kayes. *Mali médical*, **36**, 1-7.

[24] Maiga, D., Goita, D., Samaké, M., *et al*. (2023) Epidemiological and Clinical Aspects of Chronic Renal Failure in the Medical Department at the Hospital of Sikasso. *Open Journal of Nephrology*, **13**, 57-66.

[25] Diallo, A., Niamkey, E. and Yao, B. (1997) L'insuffisance rénale chronique en côte d'ivoire: Étude de 800 cas hospitaliers. *Annales de Biologie Clinique*, **49**, 140-143.

[26] Fofana, A.S., Samake, M., Sy, S., Coulibaly, S.D.B., Maiga, A., Sidibe, M., *et al*. (2023) Hypertension maligne à l'hôpital Fousseyni Daou de Kayes, au Mali: Aspects épidémio-cliniques et pronostiques. *Annales Africaines de Medecine*, **16**, e5333-e5343. https://doi.org/10.4314/aamed.v16i4.6

[27] Aka, J.A., Guei, C.M., Konan, S.D., Diopoh, P.S., Sanogo, S. and Yao, H.K. (2021) Hypertension artérielle maligne en milieu néphrologique à Abidjan: à propos de 168 cas colliges au Service de Néphrologie-Médecine Interne du CHU de Treichville. *Pan African Medical Journal*, **38**, Article 305. https://doi.org/10.11604/pamj.2021.38.305.21303

[28] Pouteil-Noble, C. and Villar, E. (2001) Epidémiologie et étiologie de l'insuffisance rénale chronique. *La Revue du Praticien*, **51**, 365-371.

[29] Tounkara, A.A., Fofana, A.S., Sissoko, I., Coulibaly, N., Coulibaly, A.A.M.S. and Maïga, M.K. (2016) Causes de l'insuffisance rénale chronique du sujet noir africain: Étude rétrospective sur 18 mois dans le service de néphrologie et d'hémodialyse du CHU du Point G du Mali. *Batna Journal of Medical Sciences*, **3**, 86-89.

[30] Sabi, K.A., Gnionsahe, D.A. and Amedegnato, D. (2011) Insuffisance rénale chronique au Togo: Aspects cliniques, paracliniques et étiologiques. *Journal of Tropical Medicine*, **71**, 74-76.

[31] Janus, N. (2011) Reconnaitre le patient insuffisant rénal à l'hôpital: Évaluation de la fonction rénale. *Clinical Pharmacology*, **30**, 249-252.

[32] Ouattara, B., Kra, O., Diby, K., Thot'o, A.S., Ouattara, I. and Ndri, N. (2004) Particularités de l'insuffisance rénale chronique chez des patients adultes noirs hospitalises dans le service de médecine interne du CHU de Treichville. *Afrique Biomédicale Revue*, **9**, 66-70.

[33] Macron-Noguès, F., Vernay, M., Ekong, E., *et al*. (2007) La prévalence de l'insuffisance rénale chronique terminale traitée par dialyse en France. *Pratiques et organisation des soins*, **38**, 103-109.