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RESEARCH ARTICLE

Epidemiological, Clinical, Therapeutic and Evolutionary Aspects of Arterial Hypertension during Chronic Kidney Disease Stages 3-5 at the Borgou Departmental Teaching Hospital (Benin)

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Abstract

Introduction: Arterial hypertension is a risk factor for chronic kidney disease (CKD). The aim was to study hypertension in stage 3-5 chronic kidney disease patients in the nephrology department of the departmental teaching hospital of Borgou and Alibori (CHUD-B/A) in 2024.

Patients and Methods: This was a cohort study with prospective data collection of patients with CKD stages 3-5 admitted to the nephrology department of CHUD-B/A from 1 January 2021 to 30 September 2023. Follow-up was 12 months. Sampling was exhaustive. CKD was selected according to the KDIGO 2012 criteria. Hypertension and its evolution were retained according to the KDIGO 2021 criteria.

Results: A total of 146 patients were included. The mean age was 50.45 ± 14.03 years. Of the 146 patients, 106 had hypertension, a rate of 72.6%. Systolo-diastolic hypertension was 75.5% and grade 1 hypertension 38.6%. Chronic vascular nephropathy was 72.6%. Antihypertensive treatment consisted of calcium channel blockers (77.3%), diuretics (57.5%) and conversion enzyme inhibitors (50.9%). The blood pressure objective was achieved in half of the patients after twelve months.

Conclusion: Hypertension is common in patients with CKD stages 3-5. Management enabled blood pressure to be controlled after three months.

Keywords: Arterial hypertension, Chronic Kidney Disease, Evolution, Benin.

1. Introduction

Chronic kidney disease (CKD) has become one of the leading causes of death in the 21st century, affecting approximately 843.6 million people worldwide in 2017 [1]. Its prevalence has increased in recent years [2], with one in ten adults globally affected [3]. In 2015, more than 353 million people, or 5% of the global population, suffered from advanced CKD, with 1.2 million deaths reported [4]. In France, the prevalence of end-stage renal disease without renal replacement therapy ranged from 1.5% to 2.5% among adults aged 18–74 years between 2014 and 2016 [5]. In sub-Saharan Africa, the prevalence of advanced CKD varied from 2% to 14% in 2017 [6]. A 2019 study in Parakou, Benin, conducted in the internal medicine department of the Departmental University Hospital of Borgou, reported a 15.57% prevalence of advanced CKD, which was associated with hypertension [7].

Like CKD, arterial hypertension (AH) is a major global public health challenge due to its prevalence and complications. It affects one in four adults worldwide, and its prevalence increases with age [8]. It remains the

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leading cause of cardiovascular mortality worldwide [9]. In 2021, an estimated 1.28 billion people aged 30 to 79 had hypertension, with two-thirds living in low- and middle-income countries [10]. According to the American Heart Association, 46% of American adults have elevated blood pressure [11]. In France, between 2014 and 2016, hypertension prevalence among adults aged 18 to 74 years was 30.6%, higher in men than in women (36.5% vs. 25.2%) [13]. In Morocco, a study showed a 30% prevalence rate [14]. Houehanou et al. [15] reported hypertension prevalence rates between 16% and 40% among adults aged 18 and over in sub-Saharan Africa, exceeding 60% in people aged 65 and older in some studies. Benin is not spared from the heavy burden of hypertension.

According to the 2015 national survey on risk factors for non-communicable diseases (NCDs) using WHO's STEPS methodology, the prevalence of hypertension in Benin was estimated at 25.9% [16] and 43.9% in Parakou in 2016 according to Codjo et al. [17].

Hypertension is a risk factor for advanced CKD, and conversely, its incidence increases as kidney function declines [18]. There is a well-established relationship between hypertension and CKD, which calls for further research. In Benin, few studies have examined hypertension in patients with advanced-stage CKD. Given this context, the objective of this study was to investigate hypertension in patients with stage 3–5 CKD in the nephrology department of the Borgou and Alibori Departmental Teaching Hospital (CHUD-B/A) in 2024.

2. Methods

This was a longitudinal follow-up study with prospective data collection involving patients diagnosed with stage 3, 4, or 5 chronic kidney disease (CKD), admitted to the Nephrology Department of CHUD-B/A starting from January 1, 2021. Data collection spanned a 36-month period, from January 1, 2021, to December 31, 2023. Each patient was seen at least once a month and monitored for a minimum of 12 months.

The study population included all patients with stage 3–5 CKD who were followed in the nephrology unit during the study period. Included were patients diagnosed with CKD stage 3, 4, or 5 between January 1, 2021, and December 31, 2023, who had given their free and informed consent. Patients undergoing renal replacement therapy were not included. Also excluded were individuals who had not completed the necessary assessments or were lost to follow-up or inconsistently monitored.

A non-probabilistic sampling method was used, including all eligible patients who presented for consultation during the study period.

2.1 Main Outcomes

The primary variables of interest were the presence and progression of hypertension in patients with stage 3–5 CKD.

- Hypertension was defined as a persistent elevation of blood pressure (BP) ≥140 mmHg systolic (SBP) and/or ≥90 mmHg diastolic (DBP) [19].
- Poor hypertension control was defined, according to the 2021 KDIGO guidelines [20], as SBP >120 mmHg despite antihypertensive treatment.
- CKD was classified according to the 2012 KDIGO criteria [21].
- CKD staging was as follows:
    - Stage 3A: estimated glomerular filtration rate (eGFR) between 45–60 ml/min/1.73 m²;
    - Stage 3B: eGFR between 30–45 ml/min/1.73 m²;
    - Stage 4: eGFR between 15–30 ml/min/1.73 m²;
    - Stage 5 (renal failure): eGFR <15 ml/min/1.73 m².

Additional independent variables included sociodemographic data, lifestyle factors, clinical and paraclinical features, therapeutic regimens, and outcomes.

2.2 Data Collection

Data were collected using a pre-established and pre-tested questionnaire and case report form. Quality control of the data collection sheets was performed continuously throughout the study period.

During each consultation, a structured face-to-face interview was conducted with each patient, supplemented by direct clinical observation, anthropometric measurements, and review of medical records. Data were gathered via a semi-structured questionnaire designed on the KoBoToolbox server using the KoboCollect application (Version 1.30.1).

Blood pressure was measured on admission using a SPENGLER® electronic sphygmomanometer after

the patient had been lying supine for at least five minutes. Two to three measurements were taken at three-minute intervals, alternating between arms. The highest values were recorded. The eGFR was calculated using the Modification of Diet in Renal Disease (MDRD) formula.

2.3 Data Analysis

The questionnaire was created on the KoBoToolbox platform and digitalized for mobile data collection using KoboCollect Version 1.30.1. Data were exported from the server in Excel format for analysis using EpiInfo version 7.2.3.1 and IBM SPSS Statistics version 21. Microsoft Word 2016 was used for manuscript preparation, and Microsoft Excel 2016 for generating tables and graphs. Descriptive statistics were used: quantitative variables were expressed as means with standard deviations, and qualitative variables as proportions.

2.4 Ethical Considerations and Good Clinical Practice

This study was conducted as part of a research project at the Faculty of Medicine, University of Parakou (Benin). Ethical principles were strictly adhered to, ensuring data confidentiality throughout. Informed consent was obtained from all participants, and anonymity was preserved.

3. Results

3.1 Participation Rate

Over the course of the study, a total of 307 patients were seen in the nephrology department. Among these, 160 were diagnosed with advanced chronic kidney disease. Of this group, 154 patients met the inclusion criteria. However, six individuals undergoing hemodialysis were excluded, as well as eight others whose medical records were incomplete or who were lost to follow-up or inconsistently monitored. Ultimately, 146 patients were retained for analysis, resulting in a participation rate of 94.8%.

3.2 Prevalence of Arterial Hypertension

Among the 146 patients included in the study, 106 were diagnosed with arterial hypertension, yielding a prevalence of 72.6%. In this subgroup, the average systolic blood pressure was 161.2 ± 38.12 mmHg, while the average diastolic pressure was 100.3 ± 29.49 mmHg. Systolic values ranged from 120 to 230 mmHg, and diastolic values from 69 to 190 mmHg.

3.3 Clinical Profile of Hypertension

Regarding the type of hypertension, the combined systolic-diastolic form was the most common, observed in 75.5% of patients. Isolated systolic hypertension accounted for 18.9% of cases, while isolated diastolic hypertension was present in 5.6% of patients.

When classified by severity, grade 1 hypertension was the most frequently encountered, affecting 38.7% of patients. Grades 2 and 3 were found in 34.0% and 27.3% of cases, respectively.

3.4 Characteristics of Advanced Chronic Kidney Disease

Among hypertensive patients, the distribution across stages of CKD was as follows: 17.0% were in stage 3, 24.5% in stage 4, and 58.5% in stage 5. From an anatomo-clinical perspective, chronic vascular nephropathy was the most frequently identified etiology, found in just over half of the patients (50.9%). Chronic glomerular nephropathy was the second most common (40.6%), followed by chronic tubulo-interstitial nephropathy (6.7%) and polycystic kidney disease (1.8%).

3.5 Sociodemographic Profile

The average age of hypertensive patients was 50.45 ± 14.03 years, with ages ranging from 13 to 86 years. Men were significantly more represented, accounting for 68.8% of the sample, yielding a male-to-female ratio of 2.2. In terms of occupation, housewives were the most represented group (20.7%). From an economic standpoint, the majority of patients (62.2%) had a middle-income status, while 37.7% were from low-income backgrounds.

3.6 Associated Conditions and Lifestyle Factors

A history of hypertension was reported by 83.9% of patients. Several comorbidities were observed among the study population: heart failure was present in 31.1%, diabetes mellitus in 19.8%, hepatitis B infection and prior stroke each in 3.7%, HIV infection in 1.8%, and liver cirrhosis in 0.9% of cases.

Concerning lifestyle habits, a large proportion (78.3%) reported frequent use of traditional herbal remedies. Additionally, 28.3% engaged in self-medication with non-steroidal anti-inflammatory drugs or analgesics. Regular alcohol consumption was noted in 19.8% of patients, while 17.9% were exposed to tobacco.

3.7 Clinical Features

From a clinical perspective, conjunctival pallor was observed in 32% of patients, and peripheral

edema was present in 40.5%. Signs of right-sided heart failure were reported in 16.9%, while 16.0% showed signs consistent with left-sided heart failure. Ascites was noted in 6.8% of cases. Hepatomegaly and splenomegaly were found in 7.5% and 2.8% of patients, respectively.

3.8 Paraclinical Findings

Laboratory investigations revealed elevated serum urea in 92.4% of patients and increased creatinine levels in all cases. Electrolyte disturbances were common, including hyponatremia in 38.6%, hypokalemia in 19.8%, and hyperkalemia in 7.5%. Hypocalcemia and hyperphosphatemia were found in 43.3% and 33.9% of patients, respectively.

Dyslipidemia was also frequent, with total hypercholesterolemia observed in 16%, elevated HDL cholesterol in 31.1%, elevated LDL cholesterol in 29.2%, and hypertriglyceridemia in 30.1%. Elevated transaminase levels were reported in 9.4% (ASAT) and 8.4% (ALAT) of cases. Anemia was common, with hemoglobin levels below 10 g/dl in 56.6% of patients.

Urinalysis revealed trace albuminuria in 11.3% of patients, moderate albuminuria in 37.7%, severe in 39.6%, and very severe in 11.3%. Leukocyturia was present in 33.9%, glucosuria in 7%, and hemoglobinuria in 3.7%.

Urine sediment analysis showed an average urinary pH of 6.58 ± 0.72 and an average specific gravity of 1.020 ± 0.01. Microscopic examination revealed isomorphic hematuria in 36.8% of patients, dysmorphic hematuria in 1.7%, granular casts in 33.3%, bacteriuria in 10.5%, and transitional epithelial cells in 7%.

Renal ultrasound findings were consistent with advanced CKD, as 80.1% of patients had small, hyperechoic kidneys with loss of cortico-medullary differentiation. The remaining 19.8% had kidneys of normal size.

Fundoscopic examination identified hypertensive retinopathy in 59.4% of patients at grade 1, 23.5% at grade 2, and 16.9% at grade 3.

3.9 Therapeutic Characteristics

All patients received non-pharmacological recommendations as part of their management plan, including dietary advice to reduce salt and fat intake, smoking cessation, and the discontinuation of self-medication and excessive use of traditional herbal remedies.

Pharmacologically, antihypertensive treatment was predominantly based on calcium channel blockers, which were prescribed in 77.3% of cases. Diuretics were used in 57.5% of patients, while angiotensin-converting enzyme inhibitors (ACE inhibitors) were prescribed in 50.9%.

The majority of patients were managed with combination therapy. Triple therapy was the most common, used in 36.7% of hypertensive patients, followed by dual therapy in 30.1%. Monotherapy was prescribed in 18.2% of cases. Quadruple and quintuple therapy were less frequent, used in 13.2% and 1.8% of patients, respectively.

The most frequent drug combinations included calcium channel blockers with angiotensin II receptor blockers (ARBs), calcium channel blockers with ACE inhibitors, and triple therapy combining diuretics, ACE inhibitors, and calcium channel blockers. These combinations were prescribed in 33.3%, 27.2%, and 45.0% of patients, respectively.

Table I. *Distribution of Antihypertensive Treatment According to the Stage of Chronic Kidney Disease*

	Stage 3A (n = 6)	Stage 3B (n = 13)	Stage 4 (n = 25)	Stage 5 (n = 62)
Monotherapy	1 (16.6%)	2 (15.3%)	5 (20.0%)	11 (17.7%)
Dual therapy	1 (16.6%)	6 (46.1%)	10 (40.0%)	15 (24.1%)
Triple therapy	4 (66.6%)	2 (15.3%)	6 (24.0%)	27 (43.5%)
Quadruple therapy	0 (0.0%)	3 (23.0%)	3 (12.0%)	8 (12.9%)
Quintuple therapy	0 (0.0%)	0 (0.0%)	1 (4.0%)	1 (1.6%)

3.10 Outcomes

All 106 hypertensive patients included in the study were followed for a minimum duration of twelve months. During this follow-up period, the blood pressure target—defined as a systolic blood pressure below 120 mmHg—was achieved in half of the patients.

More specifically, 15 patients (28.3%) reached this target within the first three months of treatment, 50 patients (47.2%) by the sixth month, and 53 patients (50.0%) by the twelfth month of follow-up.

The preferred therapeutic agents in patients who achieved blood pressure control were those targeting

the renin-angiotensin-aldosterone system (RAAS), particularly angiotensin-converting enzyme inhibitors or angiotensin receptor blockers, which were prescribed in 90.5% of these cases.

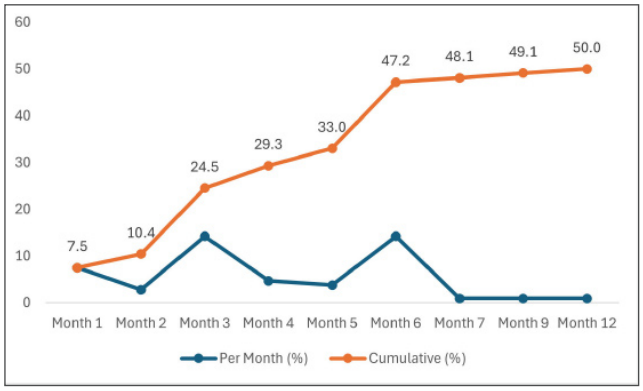

Figure 1. *Distribution of Hypertensive CKD Patients According to the Time to Achieve Blood Pressure Control (N = 53)*

4. Discussion

4.1 Limitations

Some limitations must be acknowledged. Therapeutic non-adherence was observed in several patients, largely due to the high cost of both treatment and diagnostic procedures. In addition, a number of participants lived in remote areas, which hindered regular follow-up visits. None of the patients received sodium-glucose cotransporter-2 (SGLT2) inhibitors or finerenone, as these drugs were either unavailable in the country or unaffordable for most patients.

4.2 Comparison with Other Studies

4.2.1 Prevalence of Hypertension

In this study, 72.6% of patients with advanced CKD had arterial hypertension. Similar findings have been reported in Benin. Ahoui et al. reported a prevalence of 73.4% in Cotonou in 2016 [22], and a subsequent study in Parakou in 2019 found a rate of 68.8% [23].

Comparable figures were also reported by other African authors. In Algeria, Bouricha et al. found a prevalence of 79.9% in 2018 [24], while Sinomono et al. in Gabon reported rates of 66.5% and 67.6% in separate studies [25, 26]. In Côte d'Ivoire, Tia et al. observed a prevalence of 69% in 2020 among patients with advanced CKD [27].

Conversely, Degoga et al. reported a lower rate of 61% in Mali in 2020 [28], which may be explained by differences in study design. Their study focused exclusively on patients aged 65 and over, whereas ours included all age groups.

4.2.2 Clinical Data

In our cohort, the mean blood pressure was 161.2/100.3 mmHg, with extremes ranging from 120 to 230 mmHg for systolic and 69 to 190 mmHg for diastolic pressure. This is in line with findings from Lemrabott et al., who reported an average of 158.93/98.23 mmHg [30]. These results underscore the well-established pathophysiological link between kidney disease and hypertension.

Regarding edema, 40.5% of patients exhibited renal-type edema in our study. This contrasts with the 80.8% prevalence reported by Lemrabott et al. [30]. Hypertension is a common manifestation of glomerular nephropathy, and fluid retention is a frequent consequence of declining renal function.

4.2.3 Diagnostic Aspects

Systolic-diastolic hypertension was the predominant type, affecting 74.5% of our hypertensive patients. Degoga et al. reported a lower prevalence of this form (56%) [28]. Our results differ notably from those of Djire et al., who found isolated systolic hypertension to be the most common (56%) among CKD patients in Mali in 2019 [29]. In our setting, diastolic hypertension often results from dietary excess, particularly high salt intake.

In terms of severity, grade 1 hypertension was the most frequent in our cohort (38.6%), aligning with findings from Bouricha et al., who reported a similar rate of 50.5% [24]. However, Lemrabott et al. found grade 2 hypertension to be more common (36%) [30]. These discrepancies may reflect differences in the underlying etiology of hypertension (essential vs. secondary) and the stages of CKD studied. Indeed, hypertension severity often increases with CKD progression.

4.3 Advanced CKD and Etiologies

Chronic vascular nephropathy was the most common underlying condition, identified in 72.6%

of our patients, followed by glomerular nephropathy (28.3%). This contrasts with findings by Sinomono et al., who reported hypertensive nephropathy as the second leading cause of advanced CKD (20%) [25]. Sinomono and colleagues also observed an increase in hypertension prevalence when the estimated glomerular filtration rate (eGFR) fell below 30 ml/min [41], which is consistent with our results. Bouricha et al. similarly noted a 23.34% prevalence of hypertension at severe CKD stages [24]. Our findings confirm that as CKD progresses, hypertension becomes increasingly prevalent.

4.4 Therapeutic Management

Most hypertensive patients in our study were managed with triple therapy (36.7%). Patients with stage 3B or 4 CKD were more frequently prescribed dual therapy, while those in stage 5 were predominantly on triple therapy. These trends are consistent with those reported by Djire et al. [29]. Sinomono et al. found similar results, with 60.7% of patients on triple therapy [25].

None of our patients received SGLT2 inhibitors or finerenone, due to their unavailability in the country and high cost. This limitation likely impacted the achievement of blood pressure targets.

4.5 Treatment Outcomes

All patients were followed for at least twelve months. By the end of this period, 50% had achieved the blood pressure target defined by the 2021 KDIGO guidelines. These results are consistent with findings from Hyeok-Hee et al. in South Korea in 2022, who reported that over 10% of patients achieved this strict target [31]. However, it remains challenging to reach such targets, especially in settings where newer therapeutic agents like SGLT2 inhibitors and finerenone are not used. Their availability may have further improved blood pressure control in our population.

5. Conclusion

Arterial hypertension is highly prevalent among patients with advanced chronic kidney disease. In this study, the systolic-diastolic form and grade 1 hypertension were the most frequently observed patterns. The prevalence of hypertension increased progressively with declining renal function, underscoring the close interrelationship between the two conditions. The most frequently used antihypertensive agents were ACE inhibitors, which remain the cornerstone of treatment.These findings highlight the importance of early detection and comprehensive management of hypertension in patients with CKD, as well as the urgent need to improve access to effective medications in resource-limited settings such as Benin.

6. References

1. Jager KJ, Kovesdy C, Langham R. Un numéro unique pour le plaidoyer et la communication – dans le monde, plus de 850 millions de personnes souffrent de maladies rénales. Rein Int. 2019;96:1048–50.
2. Gbaguidi G, Houehanou CY, Amidou SA, Vigan J, Houinato DS, Lacroix P. Insuffisance rénale chronique : prévalence et facteurs associés dans une population rurale au Bénin. Commun Orales / Néphrol Thérap. 2020;16:245–65.
3. World Kidney Day. World Kidney Day French [Internet]. 2022 [cited 2022 Jun 16]. Available from: https://www.worldkidneyday.org/wkd-2022-french/
4. Journée Mondiale du rein. Communiqué de presse. 2015.
5. Olié V, Cheddani L, Stengel B, Gabet A, Grave C, Blacher J, et al. Prévalence de la maladie rénale chronique en France. Néphrol Thérap. 2021;17(7):526–31.
6. ElHafeez SA, Bolignano D, D'Arrigo G, Dounousi E, Tripepi G, Zoccali C. Prevalence and burden of chronic kidney disease among the general population and high-risk groups in Africa: a systematic review. BMJ Open. 2018;8(1):e015069.
7. Ahoui S, Dovonou CA, Vigan J, Agboton BL, Alassani CA, Doritchamou E, et al. Fréquence et facteurs associés à l'insuffisance rénale chronique dans le service de médecine interne du CHU départemental du Borgou. RAFMI. 2020;8(12):816.
8. OMS. Rapport sur la situation mondiale des maladies non transmissibles. 2010 [cited 2020 Mar 5]. Available from: https://www.who.int/nmh/publications/ncd_report-summary_fr.pdf
9. Stephan D. Diagnostic et prise en charge de l'hypertension artérielle en 2015. SCRIBD. 2020 May.
10. World Health Organization. Hypertension: Key facts [Internet]. 2021. Available from: https://www.who.int/fr/news-room/fact-sheets/detail/hypertension
11. American Heart Association. More than 100 million Americans have high blood pressure, AHA says [Internet]. 2018 [cited 2018 Dec 4]. Available from: https://www.heart.org/en/news/2018/05/01/more-than-100-million-americans-have-high-blood-pressure-aha-says
12. Padwal RS, Bienek A, McAlister RA. Epidemiology of hypertension in Canada: an update. Can J Cardiol. 2016;32(5):687–94.

13. Perrine AL, Lecoffre C, Blacher J, Olié V. L'hypertension artérielle en France : prévalence, traitement et contrôle en 2015 et évolutions depuis 2006. BEF. 2018;10:170–9.

14. Enquête nationale sur les facteurs de risque communs des maladies non transmissibles 2017–2018 : Rapport. 2018.

15. Houehanou C, Amidou S, Lacroix P. Hypertension artérielle (HTA) en Afrique subsaharienne. JMV. 2018 Mar;43(2):87.

16. PNLMNT. Rapport final de l'enquête STEPS 2015 au Bénin [Internet]. 2016 [cited 2020 Mar 29]. Available from: https://www.who.int/ncds/surveillance/steps/Benin_2015_STEPS_Report_FR.pdf

17. Codjo HL, Dohou SHM, Alassani A, Ahoui S, Amegan N, Biaou CA, et al. Fréquence des complications de l'hypertension artérielle chez les patients suivis en milieu cardiologique à Parakou en 2016. Eur Sci J. 2020;16(21).

18. Halimi JM. Hypertension et insuffisance rénale. Lettre du Cardiologue. 2019;527:24.

19. Williams B, Mancia G, Spiering W, Agabiti RE, et al. Guidelines for the management of arterial hypertension. Eur Heart J. 2018;39(33):3021–104.

20. KDIGO 2021 Clinical Practice Guideline for the Management of Blood Pressure in CKD. Kidney Int. 2021;100(Suppl 45):S1–276.

21. Collège universitaire des enseignants de néphrologie. Néphrologie. 9th ed. Paris: Ellipses; 2020.

22. Ahoui S, Vigan J, Codjo LH, Dohou H, Teguia SS, Eteka E, et al. Hypertension artérielle non contrôlée et facteurs associés chez les hémodialysés chroniques du Centre National Hospitalier Universitaire de Cotonou (Bénin). WAJRH. 2016;8:44–50.

23. Ahoui S, Dovonou CA, Vigan J, Agboton BL, Alassani CA, Doritchamou E, et al. Fréquence et facteurs associés à l'insuffisance rénale chronique dans le service de médecine interne du CHUD du Borgou. RAFMI. 2020;8(12):816.

24. Bouricha K. Risque cardiovasculaire chez l'insuffisant rénal chronique [thèse de doctorat]. Tlemcen (Algérie): Université Abou Bekr Belkaïd; 2019.

25. Sinomono EDT, Gandzali Ngabé E, Gassongo KGC, Loumingou R, Mobengo JL. Hypertension artérielle chez les malades rénaux chroniques aux stades avancés noirs africains. Affiche présentée au 4e congrès de la Société Ivoirienne de Néphrologie. Abidjan; 2018.

26. Sinomono EDT, Loumingou R, Gassongo KGC, Mahoungou GH, Mobengo JL. Insuffisance rénale chronique au CHU de Brazzaville : Épidémiologie, diagnostic et évolution. Health Sci Dis. 2021;22(1):11–4.

27. Tia WM, Nda JK, Kouamé GR, Kobenan R, Daingui D, Ouattara B. Insuffisance rénale chronique : aspects épidémiologique, diagnostique, thérapeutique et évolutif au CHU de Bouaké (2016–2020). RAFMI. 2022;9(2-2):60–6.

28. Degoga MB. Insuffisance rénale du sujet âgé : aspects épidémio-cliniques, paracliniques et étiologiques [thèse de doctorat]. Bamako (Mali): Université des Sciences, Techniques et Technologies de Bamako; 2021.

29. Djire MPT. Hypertension artérielle au cours de la maladie rénale chronique : état des lieux [thèse de doctorat]. Bamako (Mali): Université des Sciences, Techniques et Technologies de Bamako; 2019.

30. Lemrabott UN, Keita IA, Faye M, Automne K, Cissé MM, Mbengue M, et al. HTA secondaire au glomérulopathie chronique au Sénégal. Néphrol Thérap. 2018;14(5):335–402.

31. Lee HH, Lee H, Tan RTR, Kim DW, Park S, Kim HC. Cardiovascular implications of the 2021 KDIGO blood pressure guideline for adults with chronic kidney disease. J Am Coll Cardiol. 2022;79(17):1675–86.