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Predictive Factors of Renal Failure in Hypertensive Patients at Chu-So Lome

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Abstract

Background: High blood pressure is a major cardiovascular risk factor in the development of stroke, heart failure, coronary heart disease and renal insufficiency (RF). In Togo, hypertension was cited as the leading cause of chronic kidney diseases (CKD) in a study carried out in the nephrology department. **Objectives:** The overall objective was to determine predictive factors RF in hypertensive patients. **Material and Methods:** We carried out an analytical and comparative study. Included in the study were all medical records of hypertensive patients who had been consulted or hospitalized in the cardiology department from January 2015 to December 2020 and who had undergone a renal workup. RF was defined for all patients by a GFR < 60 ml/min/1.73m^2 calculated according to the MDRD formula. Risk factors associated with renal failure in hypertension were assessed using univariate and multivariate logistic regression. The dependent variable was GFR status, coded 1 if GFR < 60 and 0 if not. **Results:** 364 hypertensive patients were enrolled, with an estimated incidence of renal failure of 41.8%. The mean age was 57.90 years in the general population, and 59.21 years for patients with renal failure. Females predominated, with a sex ratio of 0.78. Renal failure predominated in subjects aged 70 and over in 28% (n = 42). Hypertension was associated with the diagnosis of dilated cardiomyopathy (DCM) in 87 cases (24%) and hypertrophic cardiomyopathy (HCM) in 6 cases (1.6%). There was a statistically significant difference between the proportion of renal failure patients and non-renal failure patients as a function of age, duration of hypertension, follow-up of hypertension, grade of hypertension on admission, the presence of lower limb edema, hemoglobin level and plasma urea value. Factors associated with the onset of renal failure in hypertension were: advanced age (over 65) (OR = 2.28

95% CI [1.28 - 4.03]); unmonitored AH (OR = 2.82 95% CI [1.66 - 4.77]); grade III AH (OR = 2.05 95% CI [1.17 - 3.57]) and hyper-uremia (OR = 13.34 95% CI [7.37 - 24.14]). **Conclusion:** IR during hypertension is very common in Togo. The predictive factors found corroborate the data in the literature.

Keywords

Renal Failure, Hypertension, Uremia, Togo

1. Introduction

The World Health Organization (WHO) defines hypertension as an elevation of systolic blood pressure (SBP) greater than or equal to 140 mm Hg and/or diastolic blood pressure (DBP) greater than or equal to 90 mm Hg [1]. It affects around 20% of the world's population and is therefore a major public health issue [2]. In Togo, the prevalence of hypertension has been estimated at 36.7% in the commune of Lomé [3], 22% in urban and suburban areas in the south of the country [4] and 41.6% in the northern region [5]. High blood pressure is a major cardiovascular risk factor in the development of stroke, heart failure, coronary heart disease and renal failure (RF) [5] [6]. Data from the *US Renal Data System* reported 63,800 dialysis patients with hypertension as the presumed cause of their kidney disease, representing 25% of the dialysis population, and making it the second leading cause after diabetes. In terms of incidence, arterial hypertension accounts for 29% of new dialysis cases [7] [8]. In France, it is the leading cause of dialysis referral, just ahead of diabetic nephropathy [9]. In Africa, an estimated 55.29% of hypertensive patients with kidney damage in cardiology settings have been diagnosed in Guinea Conakry [10]. In Côte d'Ivoire, in the nephrology department of the Centre Hospitalier Universitaire (CHU) de Yopougon, hypertensive nephropathy was incriminated in 42.2% of chronic kidney diseases [11]. In Togo, hypertension was cited as the leading cause of chronic kidney diseases (CKD) in a study carried out in the nephrology department [12]. Despite the finding that renal failure is very frequent in the course of hypertension, information on the risk factors for its occurrence remains inadequate. In Togo, to the best of our knowledge, no study has been carried out on renal impairment in hypertension. It therefore seemed appropriate to conduct this study, the aim of which is to describe the factors predictive of renal failure in hypertension in our Togolese context.

2. Study Framework and Method

Setting, method and study period: Our study took place in the cardiology department of the Centre Hospitalier Universitaire Sylvanus Olympio in Lomé. It was a retrospective descriptive and analytical study of two groups of hypertensive patients with and without renal failure. The study period ran from January 1, 2015

to December 31, 2020, *i.e.*, a duration of six (06) years.

Inclusion and non-inclusion criteria: All patients aged 18 and over with known arterial hypertension who consulted or were hospitalized during the study period in the cardiology department of the CHU-SO and who had undergone a renal function test (creatininemia) were included. Patients under 18 years of age with no known arterial hypertension, hypertension with no renal work-up (or no result found), known renal disease prior to admission to the cardiology department and patients with incomplete or unusable medical records were not included. Patients admitted in the context of hypertension and pregnancy, and patients with a history of heart failure under treatment, were excluded from our study.

Data collection and processing: Data were collected using a pre-established data collection form, specifying sociodemographic data, history, reason for consultation or hospitalization, physical examination findings, paraclinical data, diagnosis associated with hypertension, treatment modalities and course of treatment. The operational variables used in this study were defined as follows: renal failure was defined by a GFR below 60 ml/min/1.73m^2 estimated by MDRD; anemia by a hemoglobin level below 11 g/dl; elderly were defined by age ≥ 65 years. Data were entered using Sphinx v5 2017 software. The database was analyzed using the same software and Epi Info 7.

Statistical analysis: Univariate and bivariate descriptive analyses were performed. Qualitative variables were presented according to their respective numbers and percentages, and quantitative variables according to their mean, standard deviation, median, interquartile ranges or extremes. A comparative analysis was performed to look for a difference between the variables collected at inclusion according to whether the GFR was below 60 or not. Statistical tests used were Pearson's Chi-square test or Fisher's exact test for qualitative variables, and Mann-Whitney test or Wilcoxon test for quantitative variables. The significance level was set at 0.05.

Univariate and multivariate logistic regression was performed to search for associated factors. The dependent variable was GFR status, coded 1 if GFR < 60 and 0 if not. The explanatory variables were selected as sociodemographic, clinical, paraclinical and therapeutic variables. Variables statistically associated with renal disease in the univariate analysis with a significance level of $p < 0.20$ were entered into the initial model. The top-down stepwise procedure was used to select the final model. This involved including all selected variables in the initial model and then progressively removing the least significant variables. At each step, we checked that there was no major confounding between the removed variable and those remaining in the model, on the basis of changes in their Odds ratios (tolerated variation: 20%) or even radical changes in their degrees of significance. Multivariate analysis was used to estimate the Adjusted Odds Ratio (aOR) and its 95% confidence interval for each retained variable. Once the final model had been obtained, we looked for interactions between the different variables in the final

model by including interaction terms (the product of the two variables concerned) in the model and checking their non-significance. The adequacy of the model was verified on the basis of the R^2 value. In the context of our study, we obtained the agreement of the ethics committee, and kept the patients' anonymity on the data sheets in order to respect medical confidentiality.

3. Results

In our study, 408 of the 456 patients had had their creatinine levels checked. Of these 408 patients, we retained 364 and excluded 44 others. 152 patients suffered from renal failure, representing a prevalence of 41.8%. The mean age was 59.21 ± 14.77 years, with extremes ranging from 24 to 88 years in patients with renal failure, and 56.96 ± 12.73 years, with extremes of 22 and 100 years in patients with normal renal function. Renal failure predominated in subjects aged 70 and over at 28% (n = 42) compared with 12% (n = 18) in subjects aged under 40. One hundred and sixty (44%) were men versus two hundred and four (56%) women, for a sex ratio of 0.78. Hypertension was associated with the diagnosis of dilated cardiomyopathy (DCM) in 87 cases (24%), hypertrophic cardiomyopathy (HCM) in 6 cases (1.6%), acute coronary syndrome (ACS) in 29 cases (8%), deep vein thrombosis (DVT) in 19 cases (5.2%), pulmonary embolism (PE) in 30 cases (8.2%) and acute pulmonary oedema (APO) in 14 cases (4%). 226 patients (62%) were on renin angiotensin system blockers and 138 patients (38%) were on other antihypertensive drugs.

There was a statistically significant difference between the proportion of renal failure patients and non-renal failure patients as a function of age, duration of hypertension and follow-up of hypertension in the comparative analysis of sociodemographic data and history (Table 1). In the comparative analysis of clinical and paraclinical data, there was a statistically significant difference according to the grade of hypertension on admission, the presence of lower limb edema, hemoglobin level and plasma urea value (Table 2). There were no statistically significant differences between renal failure and non-renal failure patients according to diagnosis, treatment or clinical course. In univariate analysis, the risk of developing renal failure was significantly higher for patients aged over 65 (OR = 1.78; 95% CI [1.13 - 2.82]; p = 0.013), subjects with hypertension for more than 5 years (OR = 1.78; 95% CI [1.16 - 2.76]; p = 0.01), hypertensive patients with no follow-up (OR = 2.9; 95% CI [1.86 - 4.52]; p = 0.001), patients with grade III hypertension (OR = 2.46; 95% CI [1.52 - 4.00]; p = 0.001), patients with lower limb edema (OR = 1.66; 95% CI [1.04 - 2.64]; p = 0.03), patients with hyper uremia (OR = 14.38; 95% CI [8.08 - 25.61]; p = 0.001), patients with hypochloremia (OR = 1.80; 95% CI [1.04 - 3.12]; p = 0.03), patients with leukopenia (OR = 4.36; 95% CI [2.61-7.28]; p = 0.001), patients with anemia (OR = 1.81; 95% CI [1.04 - 3.12]; p = 0.03), patients with LVH on ECG (OR = 1.96; 95% CI [1.25 - 3.07]; p = 0.004) and finally patients with cardiomegaly on radio-thorax (OR= 3.61; 95% CI [1.15 - 1.32]; p = 0.031) as shown in Table 3.

Table 1. Comparative analysis of sociodemographic and antecedent data.

	Total	Renal failure (GFR < 60)		p
	N = 364	No, n_1 = 212	Yes, n_2 = 152	
Age				**0.01**
<65 years	260 (71.4%)	162 (76.4%)	98 (64.5%)	
≥65 years	104 (28.6%)	50 (23.6%)	54 (35.5%)	
Gender				0.49
Female	204 (56%)	122 (59.8%)	82 (40.2%)	
Male	160 (44%)	90 (56.3%)	70 (43.8%)	
Profession				0.88
Civil servant	48 (13.2%)	30 (14.1%)	18 (12%)	
Retired	52 (14.3%)	30 (14.1%)	22 (14.5%)	
Clerk	59 (16.2%)	34 (16%)	25 (16.4%)	
Housekeeper	72 (20%)	39 (16%)	33 (22%)	
Other	60 (16.5%)	32 (15%)	28 (18.4%)	
Duration of hypertension				**0.018**
<1 year	57 (16%)	33 (15.6%)	24 (16%)	
1 - 5 years	164 (45%)	108 (51%)	56 (37%)	
≥5 years	135 (37%)	67 (32%)	68 (45%)	
Follow-up of hypertension				**0.001**
Yes	178 (49%)	126 (59%)	52 (34.2%)	
No	167 (46%)	76 (36%)	91 (60%)	
SRAA blocker				0.42
Yes	226 (62%)	128 (60%)	98 (64.5%)	
No	138 (38%)	84 (40%)	54 (35.5%)	
Diabetes	56 (15.4%)	34 (16%)	22 (14.5%)	0.76
Habits and lifestyle				0.79
Alcohol	77(21.1%)	46 (21.7%)	31 (20.4%)	
Tobacco	14 (4.0%)	8 (4.0%)	6 (4.0%)	
Traditional herbal teas	9 (27.2%)	62 (29.2%)	37 (24.3%)	
Family history				0.6
Hypertension	124 (34%)	68 (32%)	56 (37%)	
Diabetes	28 (8.0%)	16 (7.5%)	12 (8.0%)	

Table 2. Comparative analysis of clinical and paraclinical data.

	Total	Renal failure (GFR <60)		p
	N = 364	No, n_1 = 212	Yes, n_2 = 152	
Symptoms				0.25
Dyspnea	249 (68.4%)	136 (64.1%)	113 (74.3%)	
Palpitations	46 (12.6%)	32 (15.1%)	14 (9.2%)	
Chest pain	65 (18%)	37 (17.4%)	28 (18.4%)	
Others	48 (13.2%)	30 (14.1%)	18 (12%)	
BMI				0.42
Normal	25 (7%)	15 (7%)	10 (6.6%)	
Overweight	44 (12.1%)	28 (13.2%)	16 (10.5%)	
Obesity	58 (16%)	37 (17.4%)	21 (14%)	
Hypertension grade at entry				**0.003**
Normal BP	110 (30.2%)	77 (36.3%)	33 (22%)	
grade I	64 (17.6%)	38 (18%)	26 (17.1%)	
grade II	76 (21%)	45 (21%)	31 (20.4%)	
grade III	114 (31.3%)	52 (25%)	62 (41%)	
Lower limb edema				**0.02**
Presents	101 (28%)	49 (23%)	52 (34.2%)	
Absents	263 (72%)	163 (77%)	100 (66%)	
Hypertensive retinopathy				0.86
Yes	21 (5.8%)	6 (3%)	15 (10%)	
No	3 (0.3%)	1 (0.5%)	2 (1.3%)	
Hemoglobin level				**0.02**
<11 g/dl	68/229	31	37	
≥11 g/dl	224/292	135	89	
Urea				**0.001**
Normal	224/331	172	52	
High	107/331	20	87	

Table 3. Univariate analysis.

	N	OR	IC95%	p
Gender	364	1.15	[0.76 - 1.76]	0.52
Age ≥ 65 years	104	1.78	[1.13 - 2.82]	0.013
Profession				
Civil servant	48	0.53	[0.27 - 1.01]	0.07
Retired	52	0.95	[0.51 - 1.74]	1.00
Clerk	59	0.95	[0.53 - 1.69]	0.88
Housekeeper	72	1.14	[0.67 - 1.95]	0.68
Hypertension				
Duration > 5 years	135	1.78	[1.16 - 2.76]	**0.01**
HBP not monitored	167	2.9	[1.86 - 4.52]	**0.001**
Molecules (SRAA-)	72	1.08	[0.59 - 1.99]	0.87
Diabetes	56	0.88	[0.49 - 1.58]	0.76
Symptoms				
Lower limb edema presents	101	1.66	[1.04 - 2.64]	0.03
Dyspnea	249	1.48	[0.93 - 2.37]	0.1
Palpitations	46	0.54	[0.28 - 1.07]	0.08
Chest pain	65	1.02	[0.59 - 1.76]	1.00
High BMI	102	1.85	[0.34 - 2.09]	0.81
Grade of hypertension				
Normal BP	110	0.28	[0.17 - 0.48]	**0.001**
Grade III	114	2.46	[1.52 - 4.00]	**0.001**
Biology				
Hyper uremia	331	14.38	[8.08 - 25.61]	**0.001**
Hyperglycemia	190	0.85	[0.47 - 1.55]	0.65
Total cholesterol	173	1.07	[0.45 - 2.75]	0.81
Triglyceride	167	1.72	[0.67 - 4.4]	0.32
Hypocalcemia	187	1.18	[0.65 - 2.15]	0.64
Anemia	68	1.81	[1.04 - 3.12]	0.03
Thrombocytopenia	27	1.24	[0.54 - 2.83]	0.67
ECG				
LAH	138	0.99	[0.63 - 1.56]	1.00
LVH	148	1.96	[1.25 - 3.07]	0.004
Cardiomegaly on X-ray	119	3.61	[1.15 - 1.32]	**0.031**

Table 4. Multivariate analysis.

	Initial model			Final model		
	RC	IC 95%	p	RCa	ICa 95%	p
Age			0.0084			**0.0046**
<65 years						
≥65 years	2.19	[1.22 - 2.94]		2.28	[1.28 - 4.03]	
Hypertension duration			0.10			
<5 years						
≥5 years	1.56	[0.91 - 2.67]				
Hypertension follow-up			0.000			**0.0001**
Yes						
No	2.77	[1.60 - 4.81]		2.82	[1.66 - 4.77]	
Grade of hypertension			0.017			**0.011**
Grade I and II						
Grade III	1.98	[1.13 - 3.49]		2.05	[1.17 - 3.57]	
Lower limb edema			0.27			
Absents						
Presents	1.38	[0.77 - 2.50]				
Uremia			0.000			**0.000**
Normal						
High	13.25	[7.19 - 24.43]		13.34	[7.37 - 24.14]	
LDL cholesterol			0.14			
Normal						
High	1.85	[0.80 - 4.25]				
Anemia			0.96			
No						
Yes	1.01	[0.49 - 2.09]				

Table 4 shows the results of the final model of the multivariate analysis of sociodemographic, clinical and paraclinical characteristics associated with the occurrence of RF. The final model was adjusted for age, hypertension and uremia. Adjusted for age, the risk of developing IR was 2.28 times higher for subjects aged 65 and over than for those under 65 (95% CI [1.28 - 4.03] p = 0.0046). Adjusted for hypertension, the risk of developing an RF was 2.82 times higher in hypertensive subjects not on follow-up than in those on follow-up (95% CI [1.66 - 4.77] p <

0.001), and the risk of developing an RF was 2.05 times higher in subjects with grade III hypertension on admission (95% CI [1.17 - 3.57] p = 0.011). Finally, subjects with hyperuremia had a 13.34-fold increased risk of developing RF (95% CI [7.37 - 24.14] p < 0.001).

4. Discussion

4.1. Overall Characteristics

In our study, the hospital incidence of renal failure in hypertensive patients was 41.8%. Apart from the work of Kan *et al.* in Côte d'Ivoire in 2012, which found a prevalence of 42.2% [11] consistent with our result, all similar studies in Africa show a prevalence much lower or higher than ours. For example, Kaba *et al.* in Guinea Conakry in 2003 [10] and Lemrabott *et al.* in 2016 in Dakar [13] respectively found a prevalence of 55.29% and 10.43%. The difference in study methods is the main explanation for the wide variability in prevalence in these different studies. Indeed, Kaba *et al.* in Guinea Conakry used a microalbuminuria test, which would have enabled early detection of renal vascular damage in hypertensive patients. They also chose a higher threshold to define renal failure (calculated creatinine clearance ≤ 80 ml/mm). These two approaches would have enabled them to obtain a large number of patients with renal impairment in the sample. Lemrabott *et al.* in Dakar focused on benign nephroangiosclerosis (NAS). Only patients diagnosed with benign NAS were included. Benign NAS was defined by the presence of long-standing hypertension (>3 years), GFR ≤ 60 mL/min/1.73m^2 MDRD, left ventricular hypertrophy and/or hypertensive retinopathy without other associated nephropathies.

Despite this great variability, the general observation is that the prevalence of renal failure in hypertensive patients remains high. Indeed, in several nephrology studies and works in Black Africa, hypertension is cited as one of the main causes of renal failure [14] [15]. Sabi *et al.* in 2009 [12] had already found that hypertension was the leading cause of CKD in Togo. Tsévi *et al.* in 2016 [16] found that hypertension was the main comorbidity in chronic hemodialysis patients. This high prevalence in our study (41.8%), could be explained by multiple reasons. Firstly, treatment of hypertension is costly and lifelong, which poses a problem of compliance for patients in unfavorable situations. Secondly, some antihypertensives can be nephrotoxic, especially when used in combination. In addition, increased infusion consumption and smoking can harm the kidneys. Last but not least, many patients arrive in cardiology with a highly advanced clinical picture, very often with visceral repercussions.

In our study, the mean age was 57.90 ± 13.65 years, with extremes ranging from 22 to 100 years. Age distribution showed that 31% of patients were between 50 and 60 years of age, while 8.8% were under 40. Our results were in line with the literature. Indeed, Sabi *et al.* in 2013 in Togo [17] and Lemrabott *et al.* in 2016 in Senegal [14] respectively found an average age of 51 ± 18 years (extremes: 16 - 82 years), and 56.95 ± 13.23 years. The aging of the population and the increase in

life expectancy have made it possible to observe a greater number of elderly subjects in all medical disciplines, and in particular in nephrology, where the incidence of kidney damage is tending to increase from year to year, and therefore constitutes a public health issue. Our study is no exception: we found that age was very significantly associated with renal failure, with 54% of patients with renal failure aged 70 and over.

Our study shows a predominance of women (56%) versus men (44%), with a male-female sex ratio of 0.78. The incidence rate of renal failure was slightly higher in men (70/160 men or 44%) than in women (82/204 women or 40%). This male predominance of renal failure has already been reported by some authors. In Togo, Sabi *et al.* in 2014, in a study of the direct cost of managing non-dialyzed chronic renal failure in Togo [17] and Tsévi *et al.* in 2016, in a study of chronic hemodialysis and depression at the Centre Hospitalier Universitaire Sylvanus Olympio in Lomé (Togo) [16] found that 52% and 61.4% respectively were men. In Africa, Lemrabott *et al.*, in 2016 in Senegal, in a study of benign nephroangiosclerosis [13], found similar results. The male predominance of renal failure could be due to endogenous estrogens, which have a renoprotective effect in women [18] [19].

4.2. Predictors of Renal Failure in Hypertension

According to the literature, the main factors associated with the development of chronic kidney disease in hypertensive subjects are: age, male gender, black ethnicity, uncontrolled blood pressure, the presence of hypercholesterolemia and diabetes [20]. In our study, risk factors for kidney damage included advanced age (over 65), with a 2.28-fold risk compared with those under 65; uncontrolled hypertension, with a 2.82-fold risk; grade III hypertension, with a 2.05-fold risk; and hyper-uremia, with a 13.34-fold risk.

Advanced age has been associated with renal impairment in several studies of hypertensive nephropathy. This is evidenced by an advanced mean age and a relatively high proportion of elderly patients among those with renal failure. Indeed, Kaba *et al.*, in 2003 in Guinea, in a study on the evaluation of renal impairment during adult hypertension, noted that 53.18% of their patients with renal impairment were 60 years and older, and only 5% were under 40 years of age [10]. Rule *et al.* in 2010, in a study of the relationship between age and the prevalence of histological lesions of nephroangiosclerosis in healthy adults, showed that the prevalence increased linearly from 2.7% in subjects aged 18 - 29 years to 73% in these healthy subjects aged 70 - 77 years [20]. This suggests that advanced age is a factor in the onset of renal failure, as aging kidneys become fragile and functionally less efficient, while younger age is a protective factor.

High blood pressure is recognized as a major cardiovascular risk factor in the occurrence of visceral lesions (cardiac, cerebral, ocular, renal) [5] [6]. Uncontrolled hypertension with high blood pressure is cited in numerous studies as responsible for kidney damage. Hsu *et al.* in Northern California, studied a multi-

racial cohort comprising 316,675 adults free of chronic kidney disease according to the current international definition (estimated glomerular filtration rate greater than or equal to 60 mL/min/1.73m^2 and a negative urine reactive dipstick) followed up between 1964 and 1985, a gradual correlation between BP height and the risk of CKD was confirmed [21]. This study was the first to demonstrate that even moderate increases in blood pressure are an independent risk factor for end-stage renal disease. Haroun *et al.* in Washington in 2003, in a study of risk factors for renal failure, showed that the relative risk of developing kidney disease increased in parallel with the stage of hypertension. Compared with subjects with "optimal" blood pressure (<120/80), this risk was 3.8 (0.8 - 17.2) for grade 1 hypertension, 6.3 (1.3 - 29) for grade 2 hypertension, and 8.8 (1.8 - 43) for grades 3 and 4 [22] [23]. In his 2005 study in France, Beaufils found that a PAS drop of more than 20 mm Hg under treatment was associated with a relative risk of 0.39, in other words, an almost threefold reduction in the risk of renal failure [24].

Patients with hyper-uremia in our study had a 13.34-fold risk of developing renal failure. According to the literature, the relationship between hyper-uremia and renal failure is much more limited to diagnostic guidance and severity assessment. Assessment of plasma creatinine and urea concentration using standard biochemical methods is a common approach to evaluating renal function in clinical practice [25]. Urea is produced by the liver and excreted by the kidneys. Like creatinine, an increase in plasma urea serves as an indicator of impaired renal function. However, creatinine and urea concentrations may be affected by certain foods, drugs or intestinal bacteria [25] [26]. Hyper-uremia is frequently discussed as an indication for treatment with extrarenal renal replacement therapy (ERRT), especially in the event of complications (pericarditis and uremic encephalopathy) [27].

5. Conclusion

We conducted a retrospective descriptive, analytical and comparative study between two groups of hypertensive patients, one with IR and the other without IR, over a period of six years in the cardiology department of the Centre Hospitalier Universitaire Sylvanus Olympio (CHU SO) in Lomé, in order to describe the factors predictive of renal failure during hypertension in our Togolese context. At the end of this study, it emerged that renal failure during hypertension in our context is very frequent, affecting 41.8% of patients with hypertension. The results of our study confirm the data in the literature. It is, therefore, important to actively search for renal impairment in all hypertensive patients. The management of hypertension should involve multidisciplinary collaboration. There is also an urgent need to improve the technical resources of our health facilities to enable more detailed examinations to be carried out, in particular, a renal biopsy.

Ethics

As the study concerned patient files and not the patients themselves, there was no

need to obtain the agreement of the ethics committee; however, we did obtain the agreement of the hospital management and respected patient anonymity.

Conflicts of Interest

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

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