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Factors of Uncontrolled Blood Pressure in Hypertensive Patients with Chronic Kidney Disease in the City of Boma

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Abstract: Hypertension is a public health problem and represents the main factor of cardiovascular morbidity and mortality worldwide. It is the main modifiable risk factor for stroke, heart and kidney disease (CKD). Kidney disease (CKD) is both a common cause and a sequel to uncontrolled hypertension. This article reviews the main factors in the non-control of hypertension in chronic kidney disease. Methods: Cross-sectional and analytical study including 395 patients admitted to the Internal Medicine department of HGR / Boma from January 1, 2018 to January 2019. Socio-demographic, clinical and biological data were studied. A multivariate logistic regression model identified factors associated with hypertension control at the 0.05 threshold. Results: The frequency of uncontrolled hypertension was 38%. Patients < 60 years of age were more common (80%). Male subjects were more affected. The majority of patients had stage 2 kidney disease according to KDIGO (46.8%). The determinants of non-control of arterial hypertension in multivariate analysis: age > 60 years ($p < 0,005$), tobacco ($p < 0,047$) of abdominal obesity ($p < 0,008$) and hypercholesterolemia ($p < 0,014$). Conclusion: The prevalence of uncontrolled hypertension in patients with chronic kidney disease is high. It is therefore important to take into account the non-control factors in the management of hypertension.

Keywords: Frequency, Determinants, Controlled Hypertension, MRC, HGR / Boma

1. Introduction

High blood pressure is one of the conditions that affect a large part of mankind. In fact, the World Health Organization (WHO) estimates that around 24.4% of the world population had high blood pressure in 2000 worldwide. This proportion rose to 29.2% in 2015 for the general population. The WHO estimates that the number of hypertensive adults by 2025 could reach a rate of 60% or 1.5 billion of the world population will be affected [1]. Of the entire population of hypertensive people, 34, 3% come from Western countries and 65.7% from countries with limited resources. As high blood pressure is one of the known cardiovascular risk factors, it is associated with other risk factors for the outbreak of chronic no communicable diseases worldwide and particularly in sub-Saharan Africa [2-4]. Chronic kidney disease is one of its chronic, non-communicable conditions today.

Indeed, many are the studies which have on the one hand noted the frequency of arterial hypertension in the general population and on the other hand have identified the preponderant place of this factor in the advent of chronic kidney disease in the Northern hemisphere, chronic kidney disease has several etiologies: hereditary, diabetic and vascular.

In Sub-Saharan Africa (SSA), MRC mainly affects young

adults in their productive age; it is a cause of death reducing life expectancy [5-10]. Deaths can result from renal failure but also from cardiovascular complications, which are predominant in kidney patients.

Some data available from West Africa shows that CKD is common in hypertension. To this end, in Burkina Faso, the prevalence of CRF during hypertension is estimated at 38.2%, including 20.5% at the terminal stage with a mortality rate directly linked to CRF of 19.8% [11]. In Côte d'Ivoire, Diallo et al reported that the frequency of hypertension in the population of patients suffering from CKD was 30.6%, these data explain the importance in hospitals of patients with both CKD and hypertension with no obvious cause and effect relationship [12].

In DRC, the prevalence of hypertension is 27.6% in a study conducted by Sumaili. This value is practically double that found previously by Mbuyamba et al (14.2%) in rural areas with (9.9%) in urban areas [13].

The correlation between hypertension and renal failure (RI) is complex [11]. On the one hand, hypertension is a potential cause of CRF as it causes at least 30% of cases of ESRD [12, 13]; On the other hand, hypertension is a consequence of CRF because approximately 80% of patients with CRF present with hypertension in the course of their kidney disease [14]. The frequency of blood pressure (BP) monitoring is practically less known because of the cardiovascular risk factors associated with these patients. In this context, a question can be asked: what is the frequency of BP control in chronic renal failure patients with hypertension and what are the factors associated with this control.

2. Method

From January 2018 to January, 2019, we conducted a cross-sectional and descriptive study at the Boma reference hospital located in the southeast and 440 Km from Kinshasa, the capital of DR Congo.

This was a retrospective cross-sectional study carried out from January 1, 2018 to February 1, 2019 at the Boma General Referance Hospital. Were included, all patients followed for hypertension and having presented an alteration of renal function and in whom the explorations had found a marker of renal impairment (elevated creatinine, micro albuminuria, proteinuria, Pathological hematuria, pathological leukocyturia).

We excluded all hypertensive patients without renal abnormalities and whose medical records were unusable.

The parameters of interest were age, sex, the notion of taking tobacco and alcohol, physical examination including blood pressure, height, weight, the waist and the biological parameter: blood sugar, creatinine, urine strip and lipid profile. Blood pressure was measured using digital blood pressure measurement devices (OMRON MIT5 Connect, Kyoto, Japan. The average of the two measurements were used in the analysis.

Height was measured, while the participants were in an upright position without shoes, by using a flexible tape meter (Hemostyl, Sulzbach, Germany). Body weight was also measured with individuals wearing light clothing or standing without shoes using adigital weighing scale (Deluxe GBS-721; Seca Deutschland, Hamburg, Germany). Body mass index (BMI) was computed as weight in kilograms divided by height in meters squared (Kg/m^2).

A flexible tape meter was used to measure the waist at the level directly above the iliac crest.

2.1. Operational Definitions

BP control BP < 140 mmHg while on treatment among those on treatment; isolated systolic, isolated and systolic-diastolic uncontrolled BP in treated patients were defined as SBP ≥140 mmHg and DBP < 90 mmHg, SBP < 140 mmHg and DBP ≥90 mmHg and SBP ≥140 mmHg and DBP≥90 mmHg, respectively [15]. Diabetes was defined as fasting blood glucose, 110 mg/ dl or history of antidiabetic treatment [16]. Body Mass Index (BMI): computed from the height and weight of the respondent - weight divided by height squared (Kg/m^2). The BMI was further classified into four categories; underweight (BMI < 18.5 Kg/m^2), normal (BMI 18.5-24.99 Kg/m^2), overweight (BMI 25 -29.99 Kg/m^2) and obese (BMI≥30 Kg/m^2 [16].

Waist circumference (WC) was used as surrogate for abdominal obesity, defined as a WC value > 94 cm in men and > 80 cm in women [17]. Smoking was defined as current use of smoked or smokeless tobacco [18].

Talking alcohol was defined as consumption of more than 1 standard drink (which is the amount of alcohol you find in a small beer, one glass of wine, or one tot of spirits per day for females and more than 2 standard drinks for males [19]. While on their usual diet, a venous blood sample was taken from an antecubital vein for the determination of levels of cholesterol and its sub-fractions, and triglycerides using enzymatic methods (Biomérieux France). Low-density lipoprotein cholesterol (LDL-C) was calculated using the Friedewald formula [20]. High LDL-c; LDL 100 mg / dl, low HDL-c; HDL-c < 40 mg / dl (M), < 50 mg (F), Hypercholesterolemia; total cholesterol ≥ 20 mg / dl [20].

Chronic kidney disease (CKD) was defined by a GFR-MDRD < 90 ml / min / 1.73m^2 and classified according to KDIGO 2012 as follows: stage 1: a≥GFR 90 m1 / min / l, 73m; stage 2: DFG 60 – 89 m1 / minll, 73m^2 stage 3 to: DFG 45 - 59 ml / minll, 73m^2 stage 3 b: DFG 30 - 44 ml / minll, 73m^2 stage 4: DFG 15 – 29 ml / min / l, 73m^2 and stage 5: DFG < l5ml / min / l, 73 m^2 12 [12, 21].

Semi-quantitative proteinuria: proteinuria with the 1+ reactive strip corresponding to 30 mg / dl; ++=100 mg% and +++=500 mg%.

2.2. Data analyses

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 21 for Windows (SPSS Inc., Chicago, IL, United States). Data were expressed as mean values±standard deviations (SD) for continuous variables. Frequencies (n) and percentages (%) were reported for

categorical variables. Counts (frequency=n) and percentages (%) were reported for categorical variables. Percentages were compared using the chi-square test. The logistic regression model analysis adjusted. A p-value of < 0.05.

3. Results

The study population consisted of 395 hypertensive patients with renal impairment were followed both in outpatient and inpatient internal medicine, including 245 men and 150 women with a sex ratio M / F of 1.6 (in favor of men).

The mean age of the patients was 51.3±12.1 years (range 20 and 73 years). Alcohol and tobacco use were observed, respectively, in 65.8% and 89.9%; abdominal obesity, overweight and observed obesity were present, respectively, in 45.6%; 34.2% and 17.7%. Hypercholesterolemia, low HDL, high LDL and hypertriglyceridemia were found, respectively, in 29.1%; 67.1%; 38% and 11.4%. The mean SBP was 81.1±10.7 mm Hg in the whole group; There were no statistical differences between men and women.

Abdominal obesity was significantly higher in women (p < 0.001).

Regarding the biological characteristics of the study population according to sex, the mean values of blood glucose, total cholesterol and eGFR-MDRD were significantly higher in men (p < 0.05). The other laboratory characteristics of the patients did not show a significant difference between males and females. (Table 1)

Table 1. *General and clinical characteristics of the study population by sex.*

Variables	All n=395	Man n=230	Women n=165	p
Age, years	51,3±12,1	49,4±13,1	53,8±10,2	0,538
< 60	315 (79,7)	185 (80,4)	130 (78,8)	
> 60	80 (20,3)	45 (19,6)	35 (21,2)	
Alcohol, n (%)	260 (65,8)	145 (63,0)	115 (69,7)	0,774
Tobacco, n (%)	355 (89,9)	205 (89,1)	150 (90,9)	0,112
Abdominal obesity, n (%)	180 (45,6)	55 (23,9)	125 (75,8)	< 0,001
Overweight, n (%)	135 (34,2)	60 (26,1)	75 (45,5)	0,061
Hypercholesterolemia, n (%)	115 (29,1)	60 (26,1)	55 (33,3)	0,326
High LDL, n (%)	150 (38,0)	85 (37,0%)	65 (39,4)	0,505
HDL-c low, n (%)	265 (67,1)	145 (63,0)	120 (72,7)	0,256
Hypertriglyceridemia, n (%)	45 (11,4)	20 (8,7)	25 (15,2)	0,295
PAS, mmHg	125,9±18,2	126,2±17,8	125,6±18,9	0,579
PAD, mmHg	81,1±10,7	81,2±10,8	80,9±10,8	0,882
PP, mmHg	44,9±12,8	45,0±11,6	44,7±14,6	0,922
PAM, mmHg	96,0±12,3	96,2±12,4	95,8±12,2	0,898
Waist circumference, cm	88,9±12,3	86,7±13,1	92,1±10,5	0,314
BMI, Kg/m^2	25,1±4,9	23,5±4,8	27,4±3,9	0,057
Blood sugar, mg/dl	184,4±76,2	200,5±79,9±	161,9±65,5	< 0,001
Glycated Hb, g%	10,1±2,8	10,8±2,8	9,17±2,6	0,025
Chol T, mg/dl	174,9±48,3	175,7±49,6	173,9±47,1	0,011
LDL-c, mg/dl	116,3±44,4	119,3±45,0	112,1±43,7	0,878
HDL-c, mg/dl	38,5±16,2	37,1±16,4	40,3±15,8	0,483
Triglyceride, mg/dl	100,8±50,7	96,1±56,3	107,3±41,6	0,388
Micro/Prot 24 h, g	154,9±48,8	205,7±62,1	84,1±17,7	0,337
Serum Créatinine, mg/dl	1,08±0,34	1,17±0,4	,94±0,26	0,278
DFGe-MDRD, ml/min/1.73m^2	94,8±40,2	96,9±41,8	91,8±38,2	0,003

Figure 1 summarizes the stages of chronic kidney disease in the study population. The majority of patients had stage 2 kidney disease according to KDIGO (46.8%), followed by those who were stage 1 (41.8%) and stage 3a (10.1%).

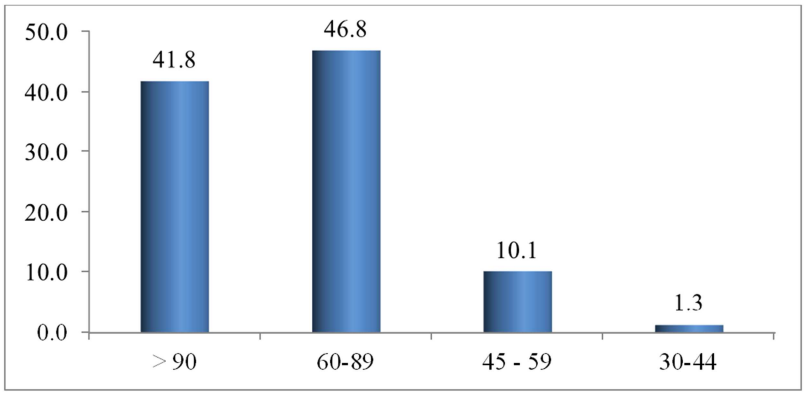

Figure 1. *Stages of CKD in the study population.*

Uncontrolled hypertension represented a frequency of 38% in the study population. The majority of patients had uncontrolled systolic and diastolic (43.3%); 30% had no diastolic control and 26.7% had no systolic control. (Table 2)

Table 2. *Average blood pressure values in the study population.*

Variables	Uncontrolled HTA N=150	HTA controlled N=245	p
PAS, mmHg	141,9±14,3	116,2±12,5	< 0,001
PAD, mmHg	89,8±7,2	75,7±8,9	< 0,001
PP, mmHg	52,1±15,5	40,5±8,3	< 0,001
PAM, mmHg	107,1±7,0	89,2±9,5	< 0,001

The mean values of PAS, PAD, PP and PAM in patients with uncontrolled hypertension were 141.9±14.3 mmHg, respectively; 89.8±7.2 mmHg, 52.1±15.5 mmHg and 107.1±7.0 mmHg.

Compared to patients with controlled hypertension (Table 3), those with uncontrolled hypertension had a significantly higher proportion of subjects aged over 60 years (26.7% vs 16.3%; p=0.007), taking tobacco (93.3% vs 87.8%; p=0.014), abdominal obesity (53.3% vs 40.8%; p=0.019) and subjects with hypercholesterolemia (40% vs 22.4%; p=0.008). The mean TT value was significantly higher in patients with uncontrolled hypertension (p=0.003).

Table 3. *Clinical and biological characteristics according to uncontrolled hypertension.*

Variables	Uncontrolled HTA n=150	HTA controlled n=245	p
Age, Years	55,9±9,3	48,4±12,8	0,007
< 60	110 (73,3)	205 (83,7)	
> 60	40 (26,7)	40 (16,3)	
Sex			0,505
Man, n (%)	85 (56,7)	145 (59,2)	
Women, n (%)	65 (43,3)	100 (40,8)	
Alcohol, n (%)	95 (63,3)	164 (67,3)	0,761
Tobacco, n (%)	140 (93,3)	215 (87,8)	0,014
Abdominal obesity, n (%)	80 (53,3)	100 (40,8)	0,019
Overweight, n (%)	50 (33,3)	85 (34,7)	0,550
Obesity, n (%)	25 (16,7)	46 (18,4)	0,551
Hypercholesterolemia, n (%)	60 (40,0)	55 (22,4)	0,008
High LDL-c, n (%)	60 (40,0)	90 (36,7)	0,478
HDL-c low, n (%)	95 (63,3)	170 (69,4)	0,376
Hypertriglyceridemia, n (%)	100 (10,0)	30 (12,2)	0,533
BMI, Kg/m^2	25,8±3,9	24,7±5,3	0,311
Blood sugar, mg/dl	185,9±73,9	183,4±78,3	0,886
Waist circumference	91,1±11,4	87,6±12,8	0,003
Glycated Hb,%	9,9±2,7	10,2±2,9	0,595
Cholesterol total, mg/dl	180,9±43,1	171,2±51,3	0,389
LDL-c, mg/dl	117,7±37,4	115,5±48,5	0,827
HDL-c, mg/dl	42,2±17,6	36,2±14,9	0,112
Triglyceride, mg/dl	105,4±58,9	97,9±45,4	0,530
Micro/Prot 24 h, g	320,6±75,7	53,4±11,9	0,017
Serum Creatinine, mg/dl	1,15±0,3	1,04±0,4	0,148
DFGe-MDRD, ml/min/1.73m^2	81,6±24,3	102,8±45,7	0,022

Table 4. *Determinants of non-control of hypertension in patients with chronic renal insufficiency in univariate and multivariate analysis.*

Variables	Univariate analysis		Multivariate analysis	
	P	OR (IC 95%)	p	ORa (IC 95%)
Age				
< 60 year		1		1
≥60 year	0,027	3,86 (1,62-5,65)		3,43 (1,42-4,84)
Tobacco				
No		1		1
Yes	0,043	4,95 (1,37-10,37)	0,047	4,91 (1,32-11,32)
Abdominal obesity				
No		1		1
Yes	0,028	3,66 (1,66-6,14)	0,008	3,30 (1,49-6,49)
MRC				
Stage 1 ou 2		1		1
Stage 3, 4 ou 5	0,032	10,20 (1,01-10,34)	0,065	1,017 (0,99-1,04)
Hypercholesterolemia				
No		1		1
Yes	0,009	2,30 (1,85-6,21)	0,014	2,20 (1,76-6,35)

The distribution of biological characteristics of the study population as a function of uncontrolled hypertension is presented in (Table 3). The 24 h micro / prot value was significantly higher in subjects with uncontrolled hypertension (p=0.017), on the other hand, this average was low for the DFGe-MDRD (p=0.022).

In univariate analysis (Table 4), age, smoking, abdominal obesity, stage of CKD and hypercholesterolemia emerged as the main factors associated with non-control of hypertension.

The strength of the association, observed in univariate analysis, persisted only for age > 60 years, smoking, abdominal obesity and hypercholesterolemia emerging as independent factors associated with non-control of hypertension. With the risk of non-control multiplied by 3 for the subject aged over 60 years, by 3 for abdominal obesity; by 5 for smoking and by 2 for hypercholesterolemia.

4. Discussion

The frequency of uncontrolled hypertension in patients with CKD was 38.0%. The data from this study is similar to the study conducted by SUMAILI on the prevalence of CKD reporting an uncontrolled hypertension frequency of 37% [13], to the study conducted by BAYAULI et al who reported a prevalence of 30% non-control in the population of Kinshasa [22] in patients with known hypertension, in fact, LONGO MBENZA et al had reported a prevalence of uncontrolled hypertension of 26% in the general population of Kinshasa [23].; however, this value is higher than a study conducted by M'BUYAMBA -KABANGU et al who reported 9.9% of uncontrolled hypertension [24].

The high prevalence of uncontrolled hypertension in this study could be explained, on the one hand, by the change in lifestyle and on the other hand by the consequence of aging populations because hypertension is strongly linked to changes. Cardiovascular diseases associated with age. Hence hypertension is a public health problem of concern for its prevalence, severity and precocity [14, 25-27]. Hospital data show that CVD represents 20.7% of all morbidity and 21% of mortality; hypertension contributes more than 12.5% of this morbidity and 14.7% of mortality [15]. Hence the importance of blood pressure controls.

The present study reported a frequency, compared to patients with controlled hypertension, those with uncontrolled hypertension had a significantly higher proportion of subjects aged over 60 years, with a history of tobacco use, abdominal obesity, and subjects with hyper cholesterolemia; the mean value of triglyceride (TT) was significantly higher in patients with uncontrolled hypertension [25-27].

The literature had shown that there is a gradient in the prevalence of hypertension parallel to the increase in BMI between populations residing in Africa [25].

The proportional rise in BMI and the prevalence of hypertension generally follows the need for westernization of the lifestyle. In our study in the majority of patients, the 24-hour micro / proteinuria value was significantly higher in subjects with uncontrolled hypertension; on the other hand this average was low for eGFR-MDRD.

Previous observations had already shown the relationship between hypertension or increased BMI and proteinuria [26].

Hypertension in CKD is often associated with several risk factors. The literature reports a constellation of risk factors associated with hypertension through insulin resistance, hyperinsulinism and catabolism observed in CKD [27].

The strength of the association observed, in univariate analysis, persisted only for age > 60 years, smoking, abdominal obesity and hypercholesterolemia emerging as independent factors associated with non-control of hypertension. with the risk of non-control multiplied by 3 for the subject aged over 60 years, by 3 for abdominal obesity; par 5 for smoking and par 2 for hypercholesterolemia.

Our results are almost similar to those of studies carried out in the DRC; indeed, Bayauli et al. had found as determinants of non-control of hypertension: advanced age, obesity and a diet low in vegetables [22]. Katchunga et al. reported in their study that advanced age, overweight and diabetes mellitus were the main determinants of non-control of hypertension [14]. In the study by Atoba et al., Advanced age, male sex, alcohol consumption emerged as determinants of non-control of hypertension [14].

Subclinical atherosclerosis was also associated with hypertension in the present study. The association between subclinical atherosclerosis and hypertension is bidirectional. In fact, hypertension, through pressure overload (Laplace's law) and the deleterious effect of the activation of the sympathetic nervous systems and renin angiotensin on the vascular wall, will lead to oxidative stress, inflammation and endothelial dysfunction responsible for atherosclerosis.

Abdominal overweight / obesity was associated with hypertension in the present study. This observation is in agreement with that made by Katchunga et al. [14] and Bayauli et al. [21] in the Congolese environment. Overweight / obesity can induce, through the release of adipokines (TNFα...), insulin resistance and subsequent hyperinsulinemia, the rise in BP is explained by several including stimulation of the sympathetic nervous systems and renin angiotensin, sodium hydroxide retention through stimulation of the Na + / H + antiport of the proximal convoluted tube of the kidneys [22, 27].

Our results are also in agreement with data from the African literature. The present study confirms that hypercholesterolemia plays an important role in the non-control of volo-dependent hypertension in black Africans; therefore, it could be explained by an excessive deposition of fat in the vessels leading to a lack of compliance [24-27].

5. Conclusion

The present study has demonstrated the frequency of uncontrolled hypertension in CKD and the associated risk factors.

The frequency of uncontrolled hypertension in the study population represented a frequency of 38.0%, those with

uncontrolled hypertension had a significantly higher proportion of subjects aged over 60 years, taking tobacco, d Abdominal obesity and obesity in subjects with hypercholesterolemia emerge as an independent risk factor for the non-control of hypertension.

Limitations of the Study

The determination of several parameters in the present study was not easy. There are many medical records of patients whose parameters of interest for the current study were missing or incomplete. The retrospective nature of the study did not allow us to search for the true determinants of the non-control of BP in patients with renal failure.

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