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High Serum Uric Acid, Anemia, Microalbuminuria, and Reduced Estimate Glomerular Filtration Rate in Africans with High Blood Pressure at Brazzaville (Congo)

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Abstract: Background: High blood pressure (HBP) is a public health problem. Its management requires a biological and morphological evaluation, looking for associated abnormalities. The aim of this study was to determine the biological abnormalities in patients with HBP and their relationship with the level of blood pressure (BP). Methods: This cross-sectional study was conducted from May to October 2018 (6 months), in outpatient consulting at the University Hospital of Brazzaville. Were included, patients followed for essential hypertension. Results: One hundred and four patients were included, 57 women (54.8%). The mean age was 54.6±12.7 years. HBP was known in 74 cases (71.2%). The associated risk factors were abdominal obesity (n=52, 50%), family history of cardiovascular disease (n=52, 50%), sedentariness (n=50, 48.1%), dyslipidemia (n= 38, 36.5%), diabetes (n=16, 15.4%), and tobacco use (n=8, 7.7%). Biological abnormalities were hyperuricemia (n=50, 52.6%), anemia (n=43, 40.4%), microalbuminuria (n= 39, 37.5%), hypernatremia (n=34, 32.7%), reduced estimate filtration glomerular rate (eGFR) in 29 cases (27.9%) and hypercholesterolemia (n=21, 20.2%) The metabolic syndrome was found in 25 cases (24%). HBP was severe in 59 cases (56.7%). The relationship between severe HBP listed: altered eGFR (n=13, 22%, OR 0.51, 95%CI 0.21-1.21), albiminuria (n=37, 62.7%, OR 1.75, 95%CI 0.8-3.86), anemia (n=23, 39%, OR 0.79, 95%CI 0.36-1.75). Conclusion: Biological abnormalities are numerous in patients with HBP monitored in Central Africa. Thus, patients are poorly controlled on treatment. Early detection of these abnormalities is necessary to improve patient care.

Keywords: HBP, High Serum Uric Acid, Anemia, Microalbuminuria, Sub-Saharan Africa

1. Introduction

High blood pressure (HBP) is a major public health problem worldwide [1]. In Sub-Saharan Africa (SSA), its prevalence continues to grow; it is responsible for high mortality [1, 2]. Also, patient care remains difficult due to the poverty of the populations, which limits access to care. The onset of complications is early and their detection is necessary at the initial stage of case management [1].

In Republic of the Congo, the prevalence of HBP was 33.5% [3], and in most of the cities of this country (Brazzaville), the proportion was 40.2% [4]. The effective management of HBP must include that of the other associated cardiovascular risk factors. Hence the realization of biological and morphological analyses should be systematic. Biological abnormalities can be related to the cause of hypertension, either to complications, but also to drugs or diet [5-9]. Thus, the link between these abnormalities and the patient's corpulence (obesity), complications (especially kidney) and some medications, have been reported in African patients with HBP by various studies [6, 9-11]. Carrying out biological analyzes is always difficult in sub-Saharan Africa, because of their high cost, and the low standard of living of the populations [12]. This assessment makes it possible to detect the other associated cardiovascular risk factors, and to assess the impact of hypertension [1, 13-15]. The aim of this study was to determine the biological abnormalities of the patients with HBP during the minimum assessment recommended by the WHO [16].

2. Methods

2.1. Study Design and Setting

This was a cross-sectional, descriptive study, carried out from June to November 2018 (6 months), in the ambulatory department of the Brazzaville University Hospital. It is the largest hospital in this Central African country, with 6 million inhabitants. This hospital as a reference level three, receives patients referred from all over the country and provides care for patients with chronic diseases on an outpatient basis.

2.2. Participant Characteristics

We had included, patients with essential HBP, aged over 18 years, with no notion of previous hospitalization and receiving or not treatment. Pregnant women were excluded, and patients with a personal history of cardiovascular complications (stroke, heart failure, renal failure). Written consent was required. Confidentiality and anonymity were respected according to the 1975 Helsinki protocol.

2.3. Variables Studies

The parameters analyzed were:

1) Epidemiological: age, sex, socio-professional status, history, lifestyle, current treatment.
2) Clinics: hypertension, abdominal perimeter, BMI;
3) Paraclinical: blood biology (fasting blood glucose, creatinine, creatin, total blood cholesterol, HDL-cholesterol, LDL-cholesterol, triglyceride, serum uric acid, blood hemoglobin, sodium and serum potassium), and urinary biology (24-hour microalbuminuria).

2.4. Data collection

The biological analyzes were carried out in the biochemistry and biological hematology laboratories of the University Hospital of Brazzaville. A CYAN Start® spectrophotometer was used for the biochemical analyses, a CYANHEMATO® automaton measured hemoglobin, and for albuminuria a NYCO Card Reader® densitometer. The blood and urine collection procedures were those laid down by this laboratory, as were the reference values.

2.5. Definitions

1) Age was considered a cardiovascular risk factor beyond 55 years in men and 65 years in women [1, 16].
2) Employee: any patient with regular remuneration coming either from an employer or from any gainful activity of which he is the promoter;
3) Excessive alcohol intake was defined as consumption of alcoholic beverages at least 3 times per week [3].
4) Sedentariness was defined by moderate physical activity under 150 min a week or vigorous under 75 min a week [16].
5) HBP was defined for systolic BP values greater than or equal to 140 mm Hg and or diastolic BP greater than or equal to 90 mm Hg or taking antihypertensive treatment;
6) Diabetes was retained in the presence of a fasting blood sugar >1.26g/l or the taking of antidiabetic drugs.
7) High serum uric acid was defined by an increase in uric acid >70 mg/L in women and >60 mg/L in men;
8) Obesity was defined by body mass index (BMI) calculated by Quetelet index ≥ 30 kg/m²;
9) Abdominal obesity was defined for an waist circumference > 80 cm in women and > 94 cm in men [9].
10) The metabolic syndrome was defined according to the criteria of the IDF 2008 Central Africa [9].
11) Anemia was defined by hemoglobin level <12 g/dl in women and <13 g/dl in men according to the standards of the laboratory of the University hospital of Brazzaville.
12) Hypokalemia was defined by a serum potassium value < 3.5 mEq/l;
13) Hyperkalemia was defined for serum potassium > 5mEq/l;
14) Hyponatremia was defined for serum sodium < 135 mEq/l;
15) Hypernatremia was defined for a sodium value >145 mEq/l;

16) Hypercholesteremia was defined by a total cholesterol value >2.7g/l;
17) HDL-cholesterol was considered low when its value was <0.4g/L in women and <0.5g/L in men;
18) LDL-cholesterol was high according to the value correlated to the patient's cardiovascular risk [16].
19) Hypertriglyceridaemia was defined by a rate >1.5g/l.
20) Altered estimate glomerular filtration rate (eGFR) was defined for calculated GFR by the formula MDRD < 60 ml/min/1.73m^2 [9].
21) Microalbuminuria was retained by albuminuria of 30-300 mg/24 hours, and macroalbuminuria if it was > 300 mg/24 hours.

2.6. Statistical Analysis

Data were processed using Epi Info 3.3.5© software (CDC Atlanta, USA). The qualitative variables were represented in number and percentage. Quantitative variables were expressed as means ± standard deviation and extremes. A calculation of Odds ratio (OR) with their 95% confidence interval (CI) was carried out by looking for, the associated factors with hyperuricemia, and also the level of blood pressure and some biological abnormalities. The significance level for the comparisons was p<0.05.

3. Results

3.1. Participants Characteristics

Table 1. *Distribution of patients according to associated cardiovascular risk factors.*

	n	%
Family history of CVD	52	50
Sedentariness	50	48.1
Dyslipidemia	38	36.5
Age risk factor	37	35.6
Excessive alcohol intake	27	26
Diabetes	16	15.4
Tobacco use	8	7.7

CVD: cardiovascular disease

A total of 104 patients including 57 women (54.8%) were included. The mean age was 54.6±12.7 years (range: 23 and 84). Age below 60 years was 63 cases (60.5%). The patients were salaried (n=76, 73%), self-employed (n=27, 26%). Hypertension was known in 74 cases (71.2%). Medical treatment included: enzyme convertor inhibitor or angiotensin 2 receptor antagonist (n=48, 46.2%), calcium channel blockers (n=46, 44.2%), diuretics (n=33, 31.7%) and beta-blockers (n=5, 4.8%). Associated cardiovascular risk factors are listed in Table 1. The clinical parameters of the patients are reported in Table 2. The patients had in HBP grade 1 (n=17, 16.3%), HBP grade 2 (n=26, 25%) and HBP grade 3 (n=59, 56.7%). Abdominal obesity was found in 52 cases (50%) and obesity in 32 cases (30.8%). The hypertension was grade 1 in 17 cases (16.3%), grade 2 in 26 cases (25%) and grade 3 in 59 cases (56.7%).

Table 2. *Clinical and biological parameters of patients.*

	Mean ± standard-deviation	range
Weight (kg)	81.4 ± 17.8	44 – 125
Height (m)	1.7 ± 0.1	1.5 – 1.9
BMI (kg/m2)	27.9 ± 5.9	16 -44.4
Waist circumference (cm)	94.2 ± 12.3	58 – 130
SBP (mmHg)	172.6 ± 24.7	120 – 240
DBP (mmHg)	104.8 ± 14.9	45 -159
Diuresis (ml)	1524.7 ± 504.9	495 – 4320
Hemoglobin (g/dl)	12.5 ± 1.8	7.4 -17.2
Hematocrite (%)	38.8 ± 5.1	23.8 -52.9
Fast blood glucose (g/l)	0.9 ± 0.4	0.6 – 3.6
Blood creatinine (mg/l)	12,6 ± 9,5	5,6 – 74,1
GFR (ml/min)	83.8± 35.3	8.4-197.9
Blood cholesterol (g/l)	1.9 ± 0.4	0.6 – 3
HDL cholesterol (g/l)	0.5 ± 0.2	0.1 – 1.8
LDL cholesterol (g/l)	1.3 ± 0.4	0.5 – 2.4
Triglycerides (g/l)	1 ± 0.5	0.3 – 3.6
Serum uric acid (mg/l)	60.9 ± 18	20.6 -120
Natremia (meq/l)	142.6 ± 6.1	125.8 -164.2
Blood potassium (meq/l)	4 ± 0.4	2.9 -5.1
Microalbuminuria (mg/24 h)	122.9 ± 134.5	3-450

3.2. Biological Characteristics

The biological parameters of the patients are shown in Table 2.

3.3. Biological Abnormalities

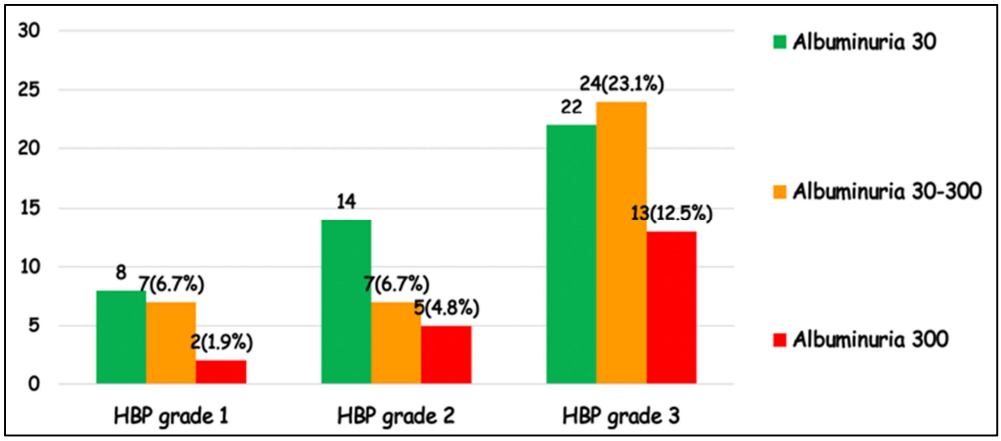
Table 3. *Biological abnormalities after laboratory analyses.*

	n	%
High serum uric acid	50	52.6
Anemia	43	40.4
Microalbuminuria	39	37.5
Hypernatremia	34	32.7
Altered eGFR	29	27.9
High LDL cholesterol	21	20.2
Low HDL cholesterol	18	17.3
High blood glucose	16	15.8
High blood triglycerides	15	14.6
Hyponatremia	7	6.7
High blood cholesterol	7	6.7
Hypokaliemia	5	4.8
Hyperkaliemia	1	1

The metabolic syndrome was found in 25 cases (24%). Biological abnormalities are shown in Table 3. Table 4 shows the relationship between hyperuricemia and some factors in univariate analysis. Figure 1 indicates the relationship between albuminuria and blood pressure level. Figure 2 illustrates the relationship between reduced eGFR and BP level. Analysis of the relationship between grade 3 HBP and biological abnormalities showed: altered eGFR (n=13, 22%, OR 0.51, 95%CI 0.21-1.21, p=0.13), albuminuria (n=37, 62.7%, OR 1.75, 95%CI 0.8-3.86, p=0.16), anemia (n=23, 39%, OR 0.79, 95%CI 0.36-1.75, p=0.57).

Table 4. *Univariate analysis of factors associated with high serum uric acid (n=50).*

	High serum uric acid		OR (95% CI)	p-value
	yes	no		
	n (%)	n (%)		
Abdominal obesity	31 (62)	21 (42)	2.5 (1.1 – 5.7)	0.02
High blood cholesterol	4 (8)	3 (6)	1.4 (0.3 – 6.9)	0.6
High LDL cholesterol	11 (22)	10 (20)	1.2 (0.4 – 3.2)	0.6
Low HDL cholesterol	8 (16)	10 (20)	0.8 (0.3 – 2.3)	0.7
High blood triglycerides	8 (16)	7 (14)	1.2 (0.4 - 3.8)	0.6



HBP: high blood pressure

Figure 1. *Relationship between albuminuria and level of blood pressure.*

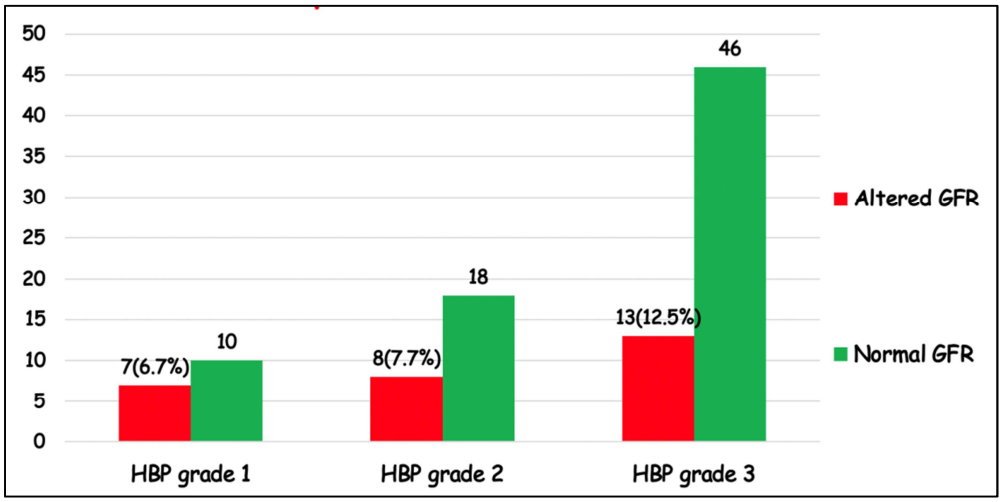


Figure 2. *Relationship between altered eGFR and level of HBP.*

HBP: high blood pressure
eGFR: estimate glomerular filtration rate

4. Discussion

The republic of the Congo is located in a region currently in epidemiological transition, where an increase in the frequency of cardiovascular diseases is observed [4, 14]. The present study has made it possible to take stock of the biological abnormalities in patients with HBP. Indeed, the realization of the biological assessment, is always difficult in our context, because of the poverty of the populations and the deficient supply care [12].

There are many risk factors during this study. In our context in particular and in sub-Saharan Africa in general, HBP is early and severe, justifying the fact that most patients consult at the stage of complications [9, 10, 12, 15].

High serum uric acid

This is the most frequent anomaly found in this study (52.6%). The link between this anomaly and cardiovascular complications in hypertensive patients is known in black Africans [17]. its frequency is high in several studies

including black Africans with HBP [6, 7, 15, 17]. Its presence increases cardiovascular risk [17]. Indeed, the metabolic syndrome is common in hypertensive black Africans [9, 13, 14]. Sometimes it reflects the presence of chronic kidney disease (CKD), or gout, which is an associated disease [6]. It can be aggravated by some drugs used against HBP, namely diuretics or others [10, 11, 15]. A study among hypertensives in the republic of the Congo, had noted a high frequency of high serum uric acid. However, no independent factor could be associated with this anomaly. In Benin, the link was established in a study in diabetic patients, between high serum uric acid and age, obesity and nephropathy [6]. Precautions should be taken, including a low purine diet, and also a medication that block uric acid production if necessary. Regular checks are necessary. Nevertheless, this anomaly will also make it possible to search, for an associated chronic kidney disease, ahead of other biological abnormalities [7, 10, 15].

Anemia

This anomaly is common in black Africans, whether or not there is a genetic hemoglobin disorder [18]. Often associated with a iron low diet, it can be aggravated by heart failure, or CKD [10, 18, 19]. Nevertheless, this anemia is often chronic, well tolerated, poorly corrected by diet and iron intake [18]. also, it becomes an important and deleterious cofactor, in the face of a major complication of hypertension (coronary artery disease, stroke, heart failure) [19]. it should also be noted that chronic anemia may reflect CKD [10].

Microalbuminuria

This anomaly reveals in the context of a patient with several risk factors, impairment of renal function, as found by Yaméogo *et al.* (36.8%) [11]. In our series, this anomaly increased with the level of HBP. This denotes the deleterious effect of HBP on the kidney [9, 10]. Indeed, the fact that 56.7% of patients in the study have severe HBP, predisposes to an early onset of complications, if appropriate care is not provided. Obesity in all its forms also contributes to the occurrence of renal impairment in high-risk hypertensive patients [9]. A place between microalbuminuria, anemia and altered eGFR should be established in this cohort. The fact that the biological abnormalities are numerous in the patients, it seems difficult to make the direct link between a direct renal damage, or the treatments. Also, environmental factors can contribute to increasing cardiovascular risk [14].

Altered eGFR

Chronic renal failure (CRF) is a serious disease, which persists for a long time, silently [10]. It often complicates poorly controlled hypertension. The management of CRF is difficult, due to the significant lack of dialysis centers, and the lack of kidney transplantation in sub-Saharan Africa [10]. In the republic of the Congo, the mortality rate attributed to CKD is 50% in hospitalized patients, and 20% were sedentary [10]. In our environment, it occurs in patients presenting numerous risk factors, and whose management is deficient. These facts quickly contribute to the onset of kidney disease [10]. Also, a share of responsibility must be sought, between renal damage, and ionic disorders, uricemia, and microalbuminuria. Indeed, these abnormalities are frequently encountered in patients with CKD [8, 10, 11, 19]. Therefore, the evaluation of renal function is systematic in patients with HBP, but in sub-Saharan Africa, the lack of access to care makes it difficult to carry out a biological assessment.

5. Conclusion and Recommendations

Biological assessment is mandatory in patients with HBP. Biological abnormalities are numerous during this assessment in our context. The factors associated with these anomalies remain to be studied in this population. Nevertheless, early detection of these abnormalities will allow appropriate management of the patient.

Conflict of Interest

The authors declare no conflict of interest.

References

[1] Williams B, Mancia G, Spiering W, Rosei EA, Azizi M, Burnie M et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension: the task force for the management of arterial hypertension of the European society of cardiology and the European society of hypertension. Eur Heart J 2018; 39 (33): 3021-3104.

[2] Farzadfar F, Finucane MM, Danaei G et al. An epidemic of risk factors for cardiovascular disease. Lancet 2011; 377: 527.

[3] Ellenga Mbolla BF, Makani Bassakouahou JK, Kouala Landa CM, Monabeka MG, Ossou-Nguiet PM, Mongo Ngamami SF et al. May Measurement Month 2019: an analysis of blood pressure screening results from Republic of the Congo. Eur Heart J Suppl 2021; 23 (Suppl B): B49-51.

[4] Ellenga Mbolla BF, Kouala Landa CM, Bakekolo PR et al. May Measurement Month 2018: an analysis of blood pressure screening results from Republic of the Congo. Eur Heart J Suppl 2020; 22 (Suppl H): H47–H49.

[5] Bachir C, Taled A, Bouraghda A. et al. Hyperuricémie et risque cardiovasculaire chez les hypertendus en consultation spécialisée dans la région de Blida. Ann Cardiol Angéiol. 2015; 64 (1): 82.

[6] Wanvoegbe F, Agbodande KA, Alassani A, Gninkoum G, Kerekou A, Azon-Kouanou D et al. Hyperuricémie chez les diabétiques de type 2 à Cotonou: prévalence et facteurs associes. J Soc Biol Clin 2017; 27: 5-9.

[7] Ikama MS, Matingou AR, Makani J, Lamini Nsoundat N, Mongo Ngamami SF et al. Hyperuricemia and associated factors during arterial hypertension in Brazzaville (Congo). World J Cardiovasc Dis 2019; 9 (3): 236-44.

[8] Perez V, Chang ET. Sodium-to-potassium ratio and blood pressure, and related factors. Adv Ntr 2014; 5: 712-41.

[9] Gombet T, Longo-Mbenza B, Ellenga Mbolla B, Ikama MS, Kimbally-Kaky G, Nkoua JL. Relationship between coronary artery disease, metabolic syndrome, energy expenditure, body composition, kidney function, and low grade inflammation among bank African employees. Diab Met Synd Clin Res Rev 2010; 4: 197-203.

[10] Eyeni Sinomono DT, Loumingou R, Gassongo Koumou GC, Mahoungou GH, Mobengo JL. Chronic renal failure in the Brazzaville university hospital center: epidemiological, clinical and evolutionary aspects. Saudi J Kidney Dis Transpl 2021; 32 (5): 1450-55.

[11] Yameogo NV, Mbaye A, Ndour M, Kagambega LJ, Diomande H, Hakim R et al. control of cardiovascular risk in black africans with type 2 diabetes in Senegal. Cardiovasc J Afr 2012; 23 (5): 270-72.

[12] Gombet TR, Ellenga Mbolla BF, Ikama MS, Kimbally-Kaky SG. Cost of emergency cardiovasculare care at the university hospital center in Brazzaville (Congo). Med Trop 2009; 69: 45-47.

[13] Millogo GRC, Samadoulougou A, Yameogo NV. Syndrome métabolique chez les patients hypertendus dans le service de cardiologie du CHU Yalgado Ouedraogo de Ouagadougou, Burkina-Faso. Pan Afr Med J 2014; 19: 290.

[14] Gombet T, Longo-Mbenza B, Ellenga Mbolla B, Ikama MS, Mokondjimobe E, Kimbally-Kaky G, Nkoua JL. Aging, female sex, migration, elevated HDL-C, and inflammation are associated with prevalence of metabolic syndrome among African bank employees. Int J Gen Med 2012; 5: 495-503.

[15] Ellenga Mbolla BF, Ossou-nguiet PM, Loumingou R, Ikama MS, Ngangoue N, Gombet TR et al. Relationship between obesity, serum uric acid, serum potassium, and glomerular filtration rate with electric left ventricular hypertrophy in blacks central africans with high blood pressure. World J Cardiovasc Dis 2018; 8: 248-55.

[16] Visseren FLJ, Mach F, Smulders YM, Carballo D, Koskinas KC, Back M et al. 2021 ESC guidelines on cardiovascular disease prevention in clinical practice. Eur Heart J 2021; 42 (34): 3227-37.

[17] Longo Mbenza B, Lukoki Luila E, Phanzu Mbete, kintoki Vita E. is hyperuricemia a risk factor of stroke and coronary artery disease among africans? Int J Cardiol 1999; 71 (1): 17-22.

[18] Chamba C, Nasser A, Mawalla WF, Masuma U, Lubuva NB, Tebuka E, Magesa P. Anaemia in the hospitalized elderly in Tanzania: prevalence, severity, and micronutrient deficit status. Anemia 2021, ID: 9523836.

[19] Ikama MS, Nsitou BM, Mongo Ngamami SF, Kimbally Kaky G, Nkoua JL, Kocko I. Prevalence of anaemia among patients with heart failure at the Brazzaville university hospital. Cardiovasc J Afr 2015; 26 (3): 140-42.