

# Uncontrolled hypertension among black Africans in the city of Brussels: a case-control study

M. DECOSTE, R. VANOBBERGHEN, L. BORGERMANS, D. DEVROEY

Department of Family Medicine, Vrije Universiteit Brussel, Belgium

**Abstract.** – **AIM:** The aim of this study is to identify determinants that are associated with uncontrolled hypertension among black Africans in the city of Brussels.

**DESIGN:** A not-matched case-control study.

**METHODS:** Seventy-five black Africans were assigned to a case group with uncontrolled hypertension and a control group with controlled hypertension. Demographic characteristics, lifestyle and compliance were recorded as well as their blood pressure. Compliance in patients was evaluated by means of the Morisky Medication Adherence Scale-4 (MMAS-4).

**RESULTS:** The mean age of the case group was 52 years (SD 7.8) and for the control group 49 years (SD 6.2). Almost 60% were women. Uncontrolled hypertension was associated with obesity ( $p = 0.01$ ) and sedentary lifestyle ( $p = 0.034$ ). About 50% of women were obese and 70% of these had uncontrolled hypertension. Patients with type 2 diabetes had a 4.5 times higher risk for uncontrolled hypertension and lower compliance to the medication regimen compared to non-diabetics. Patients were often treated with diuretics (29%), renin-angiotensin inhibitors (25%), and calcium-channel inhibitors (23%). According to the MMAS4-score uncontrolled patients had an intermediate compliance and the controlled patients had a high compliance.

**CONCLUSIONS:** Black obese women and diabetics had the highest risk for uncontrolled hypertension. Compliance was significantly lower among uncontrolled patients.

*Key Words:*

Africans, Hypertension, Diabetes, Treatment adherence.

## Introduction

### Background

Hypertension is one of the most important risk factors for cardiovascular morbidity and mortality among African Americans<sup>1</sup>. The complications of hypertension, such as stroke, left ventricular hypertrophy, heart failure, myocardial infarction,

sudden death and end stage renal insufficiency appear up to 4 times more in African Americans compared to Caucasian Americans for all levels of hypertension. Thereupon, complications appear earlier and more aggressive in the course of hypertension among African Americans<sup>1</sup>.

Uncontrolled hypertension disproportionately affects African Americans (32 to 37%), as compared to Caucasians (23%) and other ethnic groups (23%)<sup>1</sup>. Thereupon, the proportion of patients with uncontrolled hypertension is higher among African Americans (27%) than in Caucasians (17%) and other ethnic groups (20%)<sup>2</sup>.

Multiple risk factors and predisposing factors have been identified to play a role in difficulties controlling hypertension in African Americans. These factors appear to be multifactorial and multi-causal in nature.

### *Determinants for (Uncontrolled) Hypertension Among African Americans*

Hypertension among African Americans is associated by an increased salt sensitivity, increased circulating plasma volume and a low plasma renin activity. American guidelines for the non-pharmaceutical treatment of hypertension emphasise the importance of salt restriction for African Americans<sup>3,4</sup>.

Important socio-economic and demographic determinants for poor blood pressure control have been identified among African Americans. These are age over 60 year, male gender, post-menopausal age, poor access to healthcare facilities, high cost of antihypertensive medication and having no access to health insurance<sup>5-7</sup>. In addition, low education (illiteracy or only primary education) and low income have been associated with uncontrolled hypertension. Both poor compliance and a lack of regular follow-up (at least every three months) are identified as risk factors for uncontrolled hypertension among African Americans, as compared to other ethnic groups<sup>2,5,8</sup>.

Obesity, sedentarism and diabetes mellitus are the main cardiovascular risk factors hampering blood pressure control among African Americans<sup>9,10</sup>. Hypercholesterolemia, smoking, and a family history of hypertension are also associated with an increased risk for uncontrolled hypertension<sup>11</sup>.

Determinants for poor blood pressure control that are mainly related to physicians are defined as clinical inertia<sup>12</sup>. Clinical inertia is a lack of treatment initiation or intensification in a patient that is not achieving evidence-based goals of care. Clinical inertia increases the likelihood of adverse outcomes in a high proportion of patients, but it may take years for poorer clinical outcomes to become apparent<sup>13</sup>. Physician factors that contribute to clinical inertia include an overestimation of care actually delivered, a failure to identify and manage comorbid conditions, disagreements with evidence-based goals of care and the use of “soft reasons” to avoid intensification of therapy (e.g., patient refusal)<sup>14</sup>. The ignorance of physicians that African Americans need higher doses, may result in underdosing of the antihypertensive treatment<sup>15</sup>.

### ***Treatment of Hypertension***

The DASH-study (Dietary Approaches to Stop Hypertension) showed that a diet rich in vegetables, fruit, lean dairy products and limited saturated fat is associated with decreased blood pressure<sup>16</sup>, whereas salt restriction is associated with more important decreases in blood pressure especially in African Americans compared to those of Caucasians<sup>17</sup>.

Other therapeutic options are restricting alcohol and low intensity, physical exercise (3 times a week during 45 minutes), losing weight, smoking cessation and relaxation<sup>18,19</sup>.

European hypertension guidelines do not specify about the diagnosis and treatment of African Americans as a distinct risk group. American guidelines distinguish between African Americans and caucasians and suggest diuretics and calcium channel blockers as the first choice treatment for African Americans<sup>20</sup>. ACE-inhibitors and Beta-blockers are considered less effective but are still recommended because of their beneficial cardiovascular profile and nephroprotective effect (only ACE-inhibitors). Combinations with diuretics are also advised. Although ACE-inhibitors are indicated, it is known that their effectiveness among African Americans is less important. For that reason the dosage for African Americans is higher than for caucasians to attain the same decrease of the blood pressure<sup>21,22</sup>.

### ***Aim of the Study***

Until today there is only little evidence on determinants of blood pressure in hypertensive black people in Europe. This study aims to describe the socio-economic, demographic and other patient-related and physician-related characteristics that determine uncontrolled hypertension in black Africans in the city of Brussels.

The following four research questions will be answered: (1) which socio-economic and demographic determinants are associated with uncontrolled hypertension among Black Africans in the city of Brussels; (2) which cardiovascular risk factors and indicators are hampering their blood pressure control?; (3) which therapeutic lifestyle changes contribute to a better blood pressure control?; (4) which blood pressure lowering medication is prescribed by family physicians and how do physicians comply with guidelines?

## **Methods**

### ***Study Design and Participants***

The study design is a not-matched case-control design. Participants with essential or primary hypertension, who were treated for at least six months, were included. Participants needed to originate from a Western African country (Benin, Burkina Faso, Cap Verde, Ivory Coast, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo) or a Central African country (Angola, Cameroon, Central African Republic, Chad, Congo (Brazzaville and Kinshasa), Gabon, Burundi, Rwanda, Equatorial Guinea). They had to be living in Belgium for at least 3 years. According to the level of their blood pressure they were assigned to the case or the control group.

The following patients were excluded: patients aged under 18, patients diagnosed with secondary hypertension, patients living in Belgium for less than 3 years, patients not originating from a Western or Central African country, pregnant patients and patients using recreational drugs.

### ***Selection of the Cases and Controls***

Participants were included if they showed uncontrolled hypertension (mean systolic blood pressure (SBP) 140 mmHg or more, and/or mean diastolic blood pressure (DBP) 90 mmHg or more). For patients with type 2 diabetes and patients with renal insufficiency the cut-off value was defined at SBP 130 mmHg or more, and/or DBP 80 mmHg

or more. Patients with lower blood pressure were included in the control group.

The mean blood pressure was calculated from the actual blood pressure and the blood pressure values from previous consultation. Blood pressure measurements were performed according to the WHO guidelines (manual aneroid blood pressure device, patient staying in a quiet environment for 5 minutes before reading, sitting on a chair, relaxed, uncovered supported arm, elbow bent, cuff at heart level, not having smoked or drank coffee for the last 30 minutes).

### **Sample Calculation**

The sample was calculated for an unmatched case-control study with a confidence interval of 95%, a power of 80%, a ratio of 1:1 “case” for each “control” and a frequency of exhibition of 30% in the control group of factors/determinants of uncontrolled hypertension in the Black African hypertensive population, to detect a 3.0 odds ratio.

The 30% exposure in the control group was based on prevalence rates of demographic, socio-economic, clinical characteristics and behavioural factors by ethnicity in the United States, from the Health Behaviours and Racial disparity in Blood Pressure Control in the National Health and Nutrition Examination Survey Study (20), conducted in 2010. The sample had to contain at least 55 cases and 55 controls.

### **Recruitment of Participants**

Both cases and controls were recruited through several primary care facilities in Brussels: family physicians, home care and nursing, and nursing homes in the city of Brussels.

All potential participants were interviewed and if inclusion criteria were met patients were invited to participate in the study.

### **Ethical Considerations**

The study protocol was approved by the Ethical Committee of the University Hospital of the Vrije Universiteit Brussel, Belgium.

All participants were informed about the aim, the course, the risks and the data registration of the study. They were also informed that the participation to the study was voluntary, anonymous and confidential. All participants had to sign a document to provide their informed consent.

### **Questionnaire**

French and Dutch versions of the survey were used. Initially, information was collected on so-

cio-demographic characteristics (age, sex, origin, nationality) and the socio-economic status of the patient (education, occupation, health insurance). Subsequently, the participants were asked about aspects of their hypertension treatment: (1) management and treatment of cardiovascular risk factors: smoking cessation, hypercholesterolemia, diabetes, familial hypertension, body mass index (BMI), weight and size; (2) therapeutic lifestyle changes for hypertension: use of DASH diet, salt restriction, alcohol restriction, physical activity, weight reduction and relaxation; (3) pharmacological treatment which anti-hypertensives and dosage including calcium channel blockers or diuretics in the therapy, need for up-titration or substitution of medication in the past, other blood pressure lowering medications; (4) compliance with the therapeutic medication regimen based on the dichotomous version (yes/no answers) of the 4-item Morisky Medication Adherence Scale (MMAS-4)<sup>23</sup>, with a score between the 0-1 referring to “high adherence”, between the 1-2 to ‘intermediate adherence’ and between 3-4 with to “low adherence” (Yes-answer = 1 point). Finally, the participants were asked whether or not they had a 3 monthly consultation for the follow-up on their blood pressure and a re-evaluation of the medication.

### **Collection of Data**

Participants were interviewed by one of the Authors (MD) who assisted them in completing the questionnaire and who recorded data on blood pressure. Two blood pressure values were recorded for the study: (1) the blood pressure after completing the survey and (2) the blood pressure during the last consultation as taken by the family physician. Renal insufficiency was defined as a glomerular filtration rate (eGFR) below 60 ml/min considering the mean creatinine value of the 2 latest creatinine determinations in their electronic medical record. The eGFR value was estimated with the Cockcroft and Gault formula based on average creatinine, age, weight and sex.

### **Statistical Analysis**

The descriptive analyses were performed with Microsoft Excel 2010<sup>®</sup>. For more extensive analyses IBM SPSS 20<sup>®</sup> was used. Bivariate analyses were performed using the Chi-square statistics on dichotomised or categorical variables. A Fisher Exact adjustment (\* in the tables)

was used when one of the subgroups had less than 5 subjects. Continuous variables were analysed using *t*-tests.  $p < 0.05$  was considered statistically significant.

## Results

### Study Population

A total of 79 patients were included in the study. Four patients did not meet the inclusion criteria. Finally 43 cases (with poorly controlled hypertension) and 32 controls (with controlled hypertension) were included for statistical analyses.

**Table I.** Baseline characteristics of the participants for the cases and the control group.

	Case group n = 43	Control group n = 32	p-value
<b>Age and gender</b>			
Women	63%	62%	0.98
Mean age in years (SD)	52 (7.8)	49 (6.2)	0.06
Age > 60 years	12%	3%	0.37*
<b>Origin of the participants</b>			
Congo	53%	47%	0.57
Rwanda	16%	22%	0.54
Guinea	5%	16%	0.22*
Burundi	14%	0%	0.08*
Angola	5%	6%	0.83*
Togo	7%	9%	0.96*
Other countries	0%	0%	–
Belgian nationality	53%	60%	0.61
<b>Education</b>			
Higher education	33%	37%	0.66
Grade school	44%	47%	0.82
Primary school	18%	16%	0.97*
Illiteracy	5%	0%	0.61*
<b>Profession</b>			
Employe	35%	28%	0.53
Functionary	0%	6%	0.35*
Labourer	14%	16%	0.87*
Independent	0%	0%	–
Unemployed or housewife/man	51%	50%	0.92
Other	0%	0%	–
<b>Health care provision</b>			
No healthcare insurance	2%	0%	0.65*
Subscribed in a communityhealth centre	51%	72%	0.07

\* Fisher exact Chi-square.

### Demographic and Socio-Economic Characteristics

Most participants were women (63% in the cases group and 62% in the control group). Mean age in the case group was 52 years (Table I) and in the control group 49 years ( $p = 0.06$ ).

Although there were no significant differences between the mean age of both groups, Figure 1 shows that almost 50% of the cases belonged to the age group between 55 and 64 years, and that most of the control cases were aged below 55.

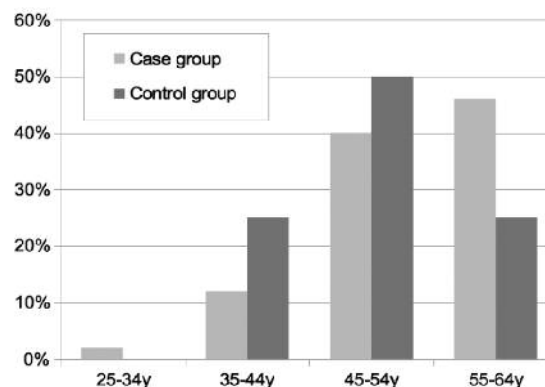
The origin of the participants in the case group and in the control group was quite similar: in both groups almost 50% originated from Congo and almost 20% from Rwanda. The remaining 30% originated from Guinea, Burundi, Angola and Togo. There were no participants originating from other countries. Sixty percent of the participants in the control group had the Belgian nationality, as compared to 53% in the case group.

No significant differences were observed when comparing the level of education of the case and control group.

### Risk Factors for Uncontrolled Hypertension

The mean SBP and DBP were significantly higher in the case group than in the control group (Table II). But for creatinine and eGFR no such difference was observed between both groups nor for the prevalence of renal insufficiency.

No differences were found between the two groups for hypercholesterolemia or a family history of hypertension, but diabetes was more prevalent among the participants with uncontrolled hypertension. For patients with type 2 diabetes a more severe cut-off value for hypertension (130/80 mmHg) was used. In total 30% of the participants had diabetes and 80% of them had uncontrolled hypertension.



**Figure 1.** Age distribution of cases and controls.

**Table II.** (co)morbidity for the cases and the control group.

	Case group n=43	Control group n=32	p-value
Systolic blood pressure, in mmHg (SD)	149 (13)	132 (6.4)	< 0.001
Diastolic blood pressure, in mmHg (SD)	86 (8.8)	79 (5.8)	< 0.001
Creatinine, in mg/dL (SD)	1.0 (0.38)	0.9 (0.17)	0.16
EGFR, in ml/min (SD)	99 (16)	91 (26)	0.13
Renal insufficiency	14%	6%	0.49*
Hypercholesterolemia	44%	41%	0.75
Diabetes mellitus	42%	13%	0.01*
Body mass index, in kg/m <sup>2</sup> (SD)	29.9 (3.9)	27.6 (4.3)	0.30
Obesity	51%	25%	0.02
Family history of hypertension	53%	44%	0.53
Smoking	5%	9%	0.72*
Sedentary lifestyle	79%	56%	0.03

\*Fisher exact Chi-square.

There were no significant differences between both groups for BMI although obesity was significantly more observed in those with uncontrolled hypertension compared to those with controlled hypertension. Within our population, we found that approximately 50% of women were overweight and 70% of them had uncontrolled hypertension.

The proportions of participants who reported sedentary lifestyle were high in both groups but it was significantly more present among the cases with uncontrolled hypertension.

### **Therapeutic Lifestyle Changes**

None of the therapeutic lifestyle changes such as a DASH diet, salt restriction, alcohol restriction, weight restriction and relaxation were recorded more frequently among the participants with controlled hypertension compared to those with uncontrolled hypertension (Table III).

### **Pharmaceutical Treatment And Follow-up**

The need for an increased dosage of medication, as well as for substitution was significantly more present among the participants with uncontrolled hypertension as compared to those with controlled hypertension (Table III).

The use of blood pressure increasing drugs, neither the absence of thiazide diuretics or calcium channel blockers were related to the control of blood pressure.

Participants with uncontrolled hypertension reported significantly more often the use of multi-

ple drugs compared to those with controlled blood pressure.

No significant differences about the type of the prescribed drugs were observed between both groups. Diuretics were most prescribed in both groups. In the group with controlled hypertension, calcium channels blockers were second most prescribed. But in the poor-controlled group ACE-inhibitors or angiotensin receptor blockers were in second place.

There was no relationship between a regular 3-monthly follow-up by a physician and controlled blood pressure values.

The compliance with the therapeutic regimen among the participants with controlled blood pressure was significantly better compared to participants with uncontrolled hypertension. The first had a MMAS-4 score of 0.88 indicating a high compliance and the latter had a score of 1.40 corresponding with an intermediate compliance.

**Table III.** Treatment of hypertension for the cases and the control group.

	Case group n=43	Control group n=32	p-value
<b>Therapeutic lifestyle changes</b>			
DASH diet	53%	47%	0.57
Salt restriction	33%	28%	0.68
No alcohol restriction	40%	38%	0.85
No weight restriction	49%	44%	0.66
No relaxation therapy	53%	66%	0.29
<b>Pharmaceutical treatment</b>			
Need for increased dosing	67%	38%	0.01
Need for substitution	60%	38%	0.049
Use of blood pressure increasing drugs	28%	25%	0.78
Absence of thiazide diuretics or calcium channel blockers	12%	16%	0.43*
Total number of antihypertensive drugs, n (SD)	2.6 (1.3)	1.9 (0.9)	0.02
<b>Prescribed drugs</b>			
Diuretics	29%	28%	0.98
ACE-inhibitors or Angiotensin receptor blockers	25%	25%	0.95
Calcium channel blockers	21%	27%	0.47
Beta-blockers	23%	20%	0.64
Others	3%	0%	0.88*
<b>Compliance and follow-up</b>			
No regular follow-up	40%	28%	0.30
MMAS-4 score (SD)	0.88 (0.98)	1.40 (1.15)	0.04

\*Fisher exact Chi-square.

## Discussion

### **Concerns About the Study Population**

The attention that hypertension in African Americans receives in the US, stands in stark contrast to the limited amount of data available for European hypertensive black people.

It is not clear to what extent data on hypertension from African Americans in the US can be extrapolated to black populations in Europe. From evolutionary and genetic research, it has been shown that due to adaptations to a hot and dry climate in Africa, the indigenous population has developed a more effective sodium retention. During the trans-Atlantic slave transports, 1 out of 3 slaves died due to dehydration. Those who survived had the best performing sodium re-absorption capacity and could maintain their volume homeostasis<sup>24,25</sup>.

The selected African populations for this study (West and Central Africa), did not endure the trans-Atlantic route and did not undergo the selection at the level of the renal regulation of sodium balance. But they have the same genetic background as the African American population.

On theoretical grounds one would therefore expect to find a relatively high prevalence of hypertension and uncontrolled hypertension in patients originating from West and Central African countries, compared to the Caucasian population of Europe. Several studies support this hypothesis.

A study including 585 Caucasian Europeans and 581 black people in London showed that the prevalence of hypertension is as two times as high in black people compared to the Caucasian population (35% versus 14%)<sup>26</sup>. A more recent systematic review conducted in the United Kingdom, reported that in 10 out of 12 studies a higher diastolic and systolic blood pressure as well as hypertension was found in the black adult patients compared to the Caucasians<sup>27</sup>. Studies on uncontrolled hypertension in African Europeans (as a separate risk group) are currently very scarce.

One must also take into account the fact that African Americans are a more homogeneous entity, compared to the Belgian African population which is more heterogeneous. This hampers the extrapolation of findings from studies with African Americans to Belgian Africans. For this reason, all results in this study are compared with African Americans.

### **Limitations to the Study**

Limitations to the study are threefold. Patients were recruited in Brussels using different strate-

gies to limit selection bias. Sixty percent of the patients were recruited from three community health centres providing free medical care, 20% through home nursing services, 15% through three independent family physicians and 5% by homes for the elderly and personal contacts.

In total, 72% of participants with controlled hypertension were registered in one of the community health centres, suggesting a degree of selection bias. There is evidence that patients who receive continuous, accessible medical care, coaching and education as promoted in the community health centres show a better controlled hypertension<sup>28</sup>.

The data of this study are primarily based on 'dixit' statements of patients. The validity and reliability of the data is not optimal, which undoubtedly has translated into information bias. For some patients, however, the family physician was contacted to either confirm the information obtained or to complete missing information.

The grouping of the participants in the case group and the control group was based on the average blood pressure calculated from the blood pressure during the last consultation with the family physician and the blood pressure after the completion of the questionnaire. Possibly, the blood pressure might have been overestimated for some participants suffering from 'white coat hypertension'.

The Cockcroft-Gault equation is less accurate than the Modification of Diet in Renal Disease (MDRD) equation to estimate the GFR. The Cockcroft-Gault equation is neither adjusted for body surface area nor for race. On the other hand, the MDRD equation has an adjustment factor for African American populations. However, the Cockcroft-Gault equation based on serum creatinine values can be used to provide an accurate estimate of GFR in hypertensive African Americans<sup>29</sup>.

### **Socio-Economic and Demographic Characteristics**

The control and case group did not show significant differences on the socio-economic and demographic characteristics.

Previous studies have shown that being of male sex is a risk factor for uncontrolled hypertension in the African American population<sup>6,8,11</sup>. In our study male gender was not identified as a risk factor.

The origin of the participants in both groups corresponded roughly with the origin of the Africans living in the city of Brussels.

In an US study a low education level and a low skilled occupation was associated with uncontrolled hypertension<sup>19</sup>. This was not confirmed in our study given the similar composition of both groups on this element.

In our study there was no significant difference in age of the participants from both groups. Neither could we demonstrate that more participants with uncontrolled hypertension were aged 60 years or more as described in the literature<sup>6,11</sup>. The shift of the case patients to the higher age group (55-64 y) showed a certain tendency in that direction.

### **Associated Cardiovascular Risks**

In our study, obesity was associated with uncontrolled hypertension which has been identified as an independent risk factor for hypertension and uncontrolled hypertension. Especially in female African Americans there is an increased risk for complications of uncontrolled hypertension<sup>1</sup>. Approximately 60% of African American women above 45 years are overweight. This finding was confirmed in our study.

Some studies suggest that in African Americans the BMI is a less adequate reflection of the total body fat, and, therefore, a less good predictor of cardiovascular morbidity and mortality<sup>11</sup>. An increased abdominal circumference ( $\geq 102$  cm men,  $\geq 88$  cm for women) would show a better correlation. In this study the abdominal circumference was not measured.

Hypercholesterolemia is considered as a risk factor for uncontrolled hypertension but this was not confirmed in our study. In our study only the existence of hypercholesterolemia was identified. If we could have obtained data on the complete cholesterol panel of the participants, including HDL- and LDL-cholesterol and triglycerides, this would have led to more accurate conclusions.

Diabetes type 2 was identified as an important co-morbid disease among black Africans with uncontrolled hypertension in Belgium. Our findings on the low proportions of patients with diabetes for which their hypertension was controlled (20%) is in line with findings from the study of Jackson et al and Teitelbaum et al who found that 20% and 17% of patients with diabetes had their hypertension controlled<sup>9,11</sup>.

One possible explanation for this low proportion of diabetics with controlled hypertension is the fact that many physicians continue to maintain the reference blood pressure values of 140/90 mmHg instead of the recommended 130/80 mmHg. Thereupon there exists a lower

compliance in this population and a lower effectiveness of the prescribed anti-hypertensives.

### **Therapeutic Lifestyle Changes**

In our study we could not demonstrate an association between uncontrolled hypertension and the failure to follow a DASH diet. Neither could we associate the absence of salt or alcohol restriction, weight loss or relaxation with uncontrolled hypertension. A possible explanation for these findings is that the participants in both the case and the control group had a similar lifestyle. On the other hand, because of a lack of quantification and demarcation in time of these variables, the questions were highly susceptible to inter-individual interpretation.

Thereupon, it should be mentioned that the life habits and socio-cultural context of black people in Europe and America cannot be compared when it comes to the availability of a compulsory health insurance system and universal access to healthcare,

For sedentary lifestyle we observed a significant association with uncontrolled hypertension. This is in line with the findings of Odedosu et al<sup>19</sup> who reported on the effectiveness of moderate physical activity on optimal blood pressure control in hypertensive African Americans.

### **Pharmaceutical Treatment**

The prescribing behaviour of the physicians strongly aligned with the guidelines that specify the preferred medication for hypertension in black people, i.e. diuretics or calcium channel-blockers. These medications were often prescribed in monotherapy or in association when the blood pressure target levels were not attained. The high amount of prescribed ACE-inhibitors is also remarkable, but in line with the guidelines. For black and Caucasian diabetics, ACE-inhibitors are recommended in the therapy of hypertension because of their nephro-protective effect<sup>30</sup>.

Monotherapy brings only a minority of patients on target for blood pressure levels. Large randomised clinical trials have shown that two or more anti-hypertensives are required to control hypertension in African Americans. Patients with diabetes often needed three or more drugs<sup>20</sup>. The findings in our study are in line with these recommendations.

## **Conclusions**

This study suggests that the socio-economic status and demographic factors have no deter-

mining influence on blood pressure control within a black African hypertensive population in the city of Brussels.

Obesity, diabetes and sedentary lifestyle were significantly associated with uncontrolled hypertension. Obese and/or diabetic black Africans are a population at risk for cardiovascular complications of uncontrolled hypertension and, therefore, require additional coaching, guidance and empowerment in the treatment of hypertension to increase compliance with the therapeutic medication regimen.

Physician factors that contribute to clinical inertia did not show to be an important problem in this study, although physicians need to pay more attention to the more stringent blood pressure targets for diabetics.

The need for increased dosing and substitution of antihypertensive drugs were associated with uncontrolled hypertension in our study. Overall, the prescribing behaviour of physicians is strongly aligned with international guidelines on hypertension in black people.

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### Conflict of interest

None of the Authors has any conflict of interest.

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