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Prevalence of Undiagnosed Hypertension among the Hypertensives Living in the City of Boma. Republic Democratic Republic of the Congo

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Abstract

- ***Background*:**

Undiagnosed and uncontrolled hypertension are responsible for several cardiovascular complications, particularly in countries with limited resources. The objective of this study was to assess the extent of undiagnosed hypertension in the adult hypertensive in Boma.

- ***Methods:***

We conducted a cross-sectional study using the WHO step wise questionnaire, from March 1 to April 15, 2018. The study included all known hypertensive adults and all those who had high blood pressure during the study. The parameters of interest were age, sex, anthropometric measure and behavioral factors. Independent factors associated with undiagnosed hypertension were identified using logistic regression analysis with p <0.05 was significant

- ***Results:***

The prevalence of undiagnosed hypertension was 56. 1%. Only 47.9% had controlled BP among known hypertensive. Young age (p<0.001), no FH-HT (p= 0.030), Low SES (p<0.012) have emerged as the main determinant associated with undiagnosed hypertension.

- ***Conclusion:***

Undiagnosed hypertension was characterized by a high prevalence and suboptimal BP control. Therapeutic lifestyle changes and pharmacological treatment are needed for those hypertensive participants. Keywords: Prevalence, Undiagnosed hypertension, Boma

I. INTRODUCTION

Hypertension (HBP) is the most important cardiovascular risk, the prevalence of which 31.1% of the global population and continues to increase in low resource countries. He is responsible for high morbidity and mortality [1, 2].

The Sub-Saharan Africa (SSA), has experienced in hard-related over the past 10 years when already facing transmitted disease such as tuberculosis and Ebola which is added the burden of hypertension [3, 4].

The burden of HBP is all the more serious since a large number of people with HBP remain undiagnosed, the no control of patient already on antihypertensive medication, hence a risk of morbidity and mortality due to the occurrence of cardiovascular events such as stroke and heart disease [5]. HBP is a shadow killer because it remains as asymptomatic in most cases and only reveals itself Durant complications or during routine consultation. Traitment and control depends not only on screening, socio-economic level but also well-established traitment with good quality drugs [6-8]. The undiagnosed HBP prevalence in a population varies from one country to another and seems higher in developing countries such as RDC in which the screening and traitment strategy barely take off. For instance, the prevalence of undiagnosed hypertension appears to be much higher in developing countries [9-13]. If certain studies carries out in provinces of the RDC have found as determinant of HBP , overweight, obesity and transition away from traditional diet, those carried in Central kongo reported , socio demographic factors, such as education, are associated with higher rates of hypertension in populations [14-16].

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In countries in Sub-Saharan Africa, factors such as poor access to health information and services, and low socio-economic status have been reported to contribute substantially to the high prevalence of undiagnosed hypertension. Regarding socioeconomic status, especially in terms of level of education, and occupation, low level of education, low income and stressful life occupations have been linked with the prevalence of undiagnosed hypertension [3].

In RD Congo, all those studies that have used the WHO steps report a high prevalence of known arterial hypertension as well that unknown in the whole population. Thus, it was necessary to conduct a similar study in the port and cosmopolitan city of Boma in the R.D.Congo [14, 16-18]. Given the high prevalence Of hypertension and its complications in the city of Boma, we set ourselves the objective of determining the prevalence of undiagnosed hypertension, of mounting the strategies in order to make adequate decision-making both by the population and by authority.

II. METHODS

➢ *Study design*

This was a population-based cross-sectional study involving adult population randomly selected.

➢ *Study setting*

The study was conducted in Boma, a port city with a population of 459. 361 inhabitants, located in the province of Kongo Central at about 440 Km southwest of Kinshasa, the Capital City. It has mixed urban and rural communities and comprised of three administrative districts and one rural district.

A multistage sampling strategy was used. The city of Boma includes 3 urban districts and 1 rural district. In all these districts, the lists of existing streets were obtained and 2 streets were selected in each district using simple random sampling strategy. On the streets drawn all the inhabited plots were listed in order to constitute the sampling frame. All the parcels listed with the odd numbers have been selected. In the selected plots, all residents aged 18 or over were invited to participate in the study.

We included 1178 households in which 3510 adults consented and were examined. We retained 1246 participant whom 546 had an established hypertension diagnosis and 699 other had hypertension discovered during study

➢ *Data collection*

Data for demographic and behavioral characteristics were obtained by self-reporting during face-to-face interviews. Demographic variables included items on gender, age, and marital status, level of education, employment status, hypertension duration and average monthly income. The following behavioral variables were obtained by self-reporting: smoking, alcohol use, physical activity, and fruits and vegetables consumption. Smoking and alcohol use were assessed by self-reporting on the use of any tobacco product or alcoholic drink . Participants' levels of physical activity were obtained by self-reported engagement in moderate (yes or no) or vigorous (yes or no) intensity exercise. The questionnaire elicited information on demographic characteristics and health behaviors. The field personnel also took blood pressure and heart rate measurements, and anthropometric measurements (height, weight, and waist circumference). A pilot study was carried out with volunteers from the district of Luzolo in order to assess the tools.

➢ *Measures*

The anthropometric measurements (such as body weight, waist circumference, height) blood pressure, and pulse rate were collected by well-trained Medical students. Blood pressure was measured using digital blood pressure meters (OMRON MIT5 Connect, Kyoto, Japan). The average of the two measures was used in the FINAL analysis.

The size was measured, in a standing position, in a participant without shoes, using a flexible measuring tape (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 measuring tape was used to measure the size at the level connecting the two iliac crests.

During the survey, questionnaires on eating habits, risky behavior (smoking and smoking, lack of consumption of fruits and vegetables) and physical activities were administered.

➢ *Operational definitions*

Hypertension was defined as a BP ≥140/90 mm Hg [20] . Diabetes was defined as fasting capillary blood glucose, 110 mg/ dl or history of antidiabetic treatment [21]. Low fruit/vegetable consumption of less than 5 portions of fresh and/or cooked fruits/vegetables a day [22]. Insufficient physical activity was defined as self-reported less than 150 min of moderate intensive activity or less than 75 min vigorous intensive physical activity per week, including walking and cycling [23].

The BMI was further classified into four categories; underweight (BMI <18.5 Kg/m2), normal (BMI 18.5-24.99 Kg/m2), overweight (BMI 25 -29.99 Kg/m2) and obese (BMI ≥30 Kg/m2 [24]. Waist circumference (WC) was used as surrogate for abdominal obesity : > 94 cm in men and > 80 cm in women [25]. Cardiometabolic risk (CMR) as the waist-to -height ratio ≥ 0.5 [26].

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 [27]. Smoking was defined as the frequent use of

tobacco in all forms (smoked, prized) [20]. The socio-economic level was calculated on the basis of DRC Demographic and Health Survey (DHS) and classified into three degrees : low, middle and high socioeconomic status (SES) [28].

➢ *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 for obesity, physical activity, dietary practices, parity, income and alcohol use. A p-value of < 0.05.

➢ *Ethical approval*

Obtained from the Ethical Committee of the Ministry of Health (N°104/CNES/BN/PMMF/2018). Consent was taken from the subjects who volunteered to participate in the study. Identified hypertensive subjects were referred to the nearby clinic for treatment

III. RESULTS

Table 1. General characteristics of the 1245 participants, 455(36.5 %) were males while 790(63.5%) were females. Their mean age was 47.8±18.0 years with 22.9 %, 22.4%, 16.9 %, 16.5 % and 21.3% participants aged respectively < 30 years, 30–39 years, 40–49 years, 50-59 years and ≥ 60 years.

Most participants (73.6%) were recruited from the rural suburb; the proportion of unemployed, married, secondary education level and low SES participants was 28.9%, 50.5%, 53.2% and 60.6% respectively. Average levels of SBP, DBP, HR, BMI, WC, and capillary blood glucose were 135.7±31.0mmHg, 87.8±18.3 mmHg, 81.5±12.2 bpm, 23.8±5.2 Kg/m², 84.7±13.0 cm and 120.8±31.mg/dl, respectively.

Table 2. cardiovascular risk factor profile of th hypertension status physical inactivity (62.2%), alcohol intake (46.6%), Menopause (29.1%), FH-HT (47.0%) and obesity (11.8%) were cardiovascular risk factors most frequently reported by the participants.

➢ *Prevalence of no awareness of HBP*

The no awareness of HBP was observed in 699 (56.1%) participants (Fig.1), of whom 184 (26.3%), 394 (56.4%), 338(48.4%), 525(75.1%), 241(34.5) and 438(62.7%) were person <30 years, women, married, living in rural area, Businessmen and Low SES respectively (Table 1).

Their mean age was 44.7±17.6 years and average levels for BMI, SBP, DBP, MAP and PP were 24.1±6.0 Kg/m², 139.1±25.8 mmHg, 93.1±15.7 mm Hg , 108.4±17.4 mmHg, 46.0±19.3 mmHg respectively. The proportion of unemployed participants and those with secondary education level and low SES was 25 %, 57.7% and 62.7%, respectively.

Compared to awareness HBP participants, those with no awareness HBP status were in average significantly older (42.2±16.9 vs 44.7±17.6years;p<0.001), Gender [72.5% (female) vs 27.5% (male) ; p<0.001], SES [91.8 % (low and middle) vs 8.2% (higher); p=0.017, SBP (141.7± 20.4 vs 139.1± 25.8 mmHg ; p<0.001), DBP (97.2±11.8 vs 93.1±15.7, mmHg; p<0.001), MAP (112.1±12.2 vs 108.4±17.4 , mmHg; p<0.001), and PP (44.5±19.1vs 46.0±19.3 mmHg ; p=0.002).

With reference to cardiovascular risk profile (Table 2), physical inactivity (58.9%), central obesity (49.6%), FH-HT (44.1%), and alcohol intake (46.4%) Menopause (23.9%) were cardiovascular risk factors more frequently observed among hypertensive participants. Compared to awareness HBP participants, no awareness HBP ones had less old than no awareness HBP proportion of older participants (39.0 vs 12.1%; p<0.001), and those with physical inactivity (66.5 vs 58.9%; p<0.001), FH-HT (41.7 vs 50.7 %; p<0.011) and menopause (35.7 vs 23.9%; p<0.001).

➢ *Treatment and control of hypertension*

Of the 1245 hypertensive patients, 546 (43.9 %) of them were aware of their status of hypertension with a significantly higher proportion of women (72.51% vs 56.4 %; p<0.001) (Table 1).

Current pharmacologic antihypertensive treatment was reported by 361 (66.1%) of 546 participants aware of their hypertension status. The antihypertensive regimen was based on 1 and 2 antihypertensive drugs in 263 (72.8%) and 98 (27.2%) treated hypertensive participants (n = 361), respectively; no participant was receiving ≥3 antihypertensive drugs. In those receiving one antihypertensive drug, calcium channel blockers (55.4%) was the drug class most frequently reported by participants whereas the combination of calcium channel blockers (CCB) and angiotensin converting enzyme inhibitors (ACEIs) (26.5%) was most frequently mentioned by those receiving two drugs. BP control was observed in 164 (48.2.8%) of 188 treated hypertensive participants mainly in men than women (78.7 vs 61%; p=0.035). Systolic-diastolic uncontrolled hypertension (67.6%) was the type most frequently encountered among those with no BP control

➢ *Determinants of awareness HBP.*

In univariate analysis (Table 4), cardiovascular risk factors significantly associated with no awareness HBP were Young age (p=< 0.001) and no FH-HT (p= < 0.001). In multivariate analysis (Table 4), the associations observed in univariate analysis persisted for young age [a OR 2.00 (1.01-2.83); p=0.001)], no FH-HT [a OR 3.42 (1.12-4.79); p=0.003] and High SES (a OR 2.41 (1.91-3.69; p=0.012].

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IV. DISCUSSION

Hypertension is an important cause of death in African countries where the level of screening is still low and therapeutic inertia. The main finding of the study was 56.1% of prevalence of undiagnosed HTN among study population.

This high prevalence of undiagnosed hypertension is due to several factors, among others: urbanization, change in lifestyle, low level of study, low socio-economic level and not to mention the fact that hypertension is asymptomatic.

Higher prevalence has also been reported in Ghana by Basu et al[30] (83%) and in DRC by Atoba et al 79.6 %[29].

Many studies in Africa have reported lower prevalence by Sarra et al (39.6%%)[31] Undavalli et al (10.1%)[32] , Getachew et al, (13.3%)[33], Gudina et al (13.2%) , Bonsa et al (16.9%)[34], Anand et al (26%) [35]. Men had more undiagnosed hypertension than women (56.4% vs 43.6) %), among different types of work, among which we find that those with Businessmen and the unemployed have more undiagnosed blood pressure respectively 34.5 % and 25 %. This result corroborates those reported by of Fatiu et al. [36] and Ulasi et al. [37]. It was also higher among the people with a low socioeconomic level (62.7%) and Middle socioeconomic level (26.8%) quintiles compared to people who belonged to the High socioeconomic level (10.6%), Married 48.4%, Female 56.4% Secondary Education level 55.7 %. One interesting finding was that 43.6 % of men and 56.4% of women diagnosed with HTN were unaware of their condition. This is similar to the result reported in the literature [38, 39]. The difference observed in this study may be due to a lower participation of men, at the low education level and at the low socio-economic level in females.

The study found a higher prevalence of undiagnosed hypertension in participants of secondary education, observation reported by many authors [40, 41].

The proportion of participants aware, treated and controlled was low.This observation corroborates previous studies carried out in cities of the DRC [14,18,42]. Low proportion participants on antihypertensive therapy in the present study is consistent previous studies from DRC and other sub-Saharan African countries [18, 42] that reported values less than 50% among treated patients. Similar picture has been found for patients who achieved recommended BP goals. The majority of treated participants were receiving monotherapy with mainly calcium channel blockers. The use of a calcium channel blocker or a thiazide diuretic as first line in the treatment of hypertension of blacks, known to have a low plasma renin activity and a subsequent volume-dependent hypertension [43], The majority of treated participants were receiving monotherapy with mainly calcium channel blockers. If the use a calcium channel blocker or a thiazide diuretic as first-line drug in the treatment of hypertension of blacks, known to have a low plasma renin activity and a subsequent volume-dependent hypertension [43].

Young age, no FH-HT and low SES were independent factors associated with undiagnosed hypertension. This finding is consistent with what has been documented by many other studies. [44,45].

Low SES is associated with undiagnosed hypertension. Indeed, the difficulties of implementing screening programs and the lack of access to health care for all, constitutes a major obstacle for the management of HBP [46]. The current study does find a significant association between undiagnosed hypertension and a no family history of hypertension, the lack of association is due to a lack of information [47, 48].

V. CONCLUSION

The prevalence of undiagnosed hypertension a is high, a low level of HBP control known in Boma. Hence the need for the implementation of a consistent health policy.

➢ *Author's Contribution*

- BMN designed the project and carried out the investigation
- FLB participated in survey conception and data analysis; revised the manuscript.
- AN and PKK have conducted data analysis
- BLB, RVV, GLL, and JR M have revised the manuscript.

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ANNEXES

Variables	Over All N = 1245	awarness HBP n = 546	Undiagnosed HBP n = 699	p-value
Age, years	47.8±18.0	42.2±16.9	44.7±17.6	**<0.001**
Age categories, n(%)				**<0.001**
<30 years	285(22.9)	101(18.5)	184(26.3)	
30-39 years	279(22.4)	111(20.3)	168(24.0)	
40-49 years	211(16.9)	89(16.3)	122(17.5)	
50-59 years	205(16.5)	92(16.8)	113(16.2)	
≥60 years	265(21.3)	153(28.0)	112(16.0)	
Gender, n(%)				**<0.001**
Female	790(63.5)	396(72.5)	394(56.4)	
Male	455(36.5)	150(27.5)	305(43.6)	
Residence, n(%)				0.093
Urban	329(26.4)	155(28.4)	174(24.9)	
Rural	916(73.6)	391(71.6)	525(75.1)	
Occupation, n(%)				**0.004**
Senior Staff	235(18.9)	87(15.9)	148(21.2)	
Businessmen	406(32.6)	165(30.2)	241(34.5)	
Students	175(14.1)	75(13.7)	100(14.3)	

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Public Servants	69(5.5)	34(6.2)	35(5.0)	
Unemployed	360(28.9)	185(33.9)	175(25.0)	
Marital status, n(%)				**<0.001**
Married	629(50.5)	291(53.3)	338(48.4)	
Divorced	48(3.9)	22(4.0)	26(3.7)	
Widow	191(15.3)	103(18.9)	88(12.6)	
Single	377(30.3)	130(23.8)	247(35.3)	
Education level, n(%)				0.066
Primary/no	328(26.3)	161(29.5)	167(23.9)	
Secondary	662(53.2)	273(50.0)	389(55.7)	
University/Superior	255(20.5)	112(20.5)	143(20.5)	
SES, n(%)				**0.017**
Low	754(60.6)	316(57.9)	438(62.7)	
Middle	372(29.9)	185(33.9)	187(26.8)	
High	119(9.6)	45(8.2)	74(10.6)	
BMI, Kg/m²	23.8±5.2	24.4±6.5	24.1±6.0	**0.006**
WC, cm	84.7±13.0	85.9±13.4	85.4±13.2	0.142
SBP, mmHg	135.7±31.0	141.7±20.4	139.1±25.8	**<0.001**
DBP, mmHg	87.8±18.3	97.2±11.8	93.1±15.7	**<0.001**
MAP, mmHg	103.8±21.5	112.1±12.2	108.4±17.4	**<0.001**
PP, mmHg	47.9±19.4	44.5±19.1	46.0±19.3	**0.002**
HR, bpm	81.5±12.2	81.6±12.4	81.6±12.3	0.890
Blood glucose, mg/dl	120.8±31.	116.0±28.2	117.9±29.7	0.335

Table 1:- General characteristics of the participants accordind to knowledge of the diagnostic of HBP

Variables	**Over All n = 1245**	**Undiagnosed HBP n = 699**	**Awarness HBP n = 546**	**p-value**
Older age*, n(%)	486(39.0)	225(32.2)	261(47.8)	**<0,001**
FH-HT, n(%)	585(47.0)	308(44.1)	277(50.7)	**0.011**
FH-DM, n(%)	132(10.6)	70(10.0)	62(11.4)	0.251
FH-CVD, n(%)	84(6.7)	43(6.2)	41(7.5)	0.202
Smoking, n(%)	234(18.8)	122(17.5)	112(20.5)	0.097
Alcohol intake, n(%)	580(46.6)	324(46.4)	256(46.9)	0.448
Menopause, n(%)	362(29.1)	167(23.9)	195(35.7)	**<0.001**
Overweight, n(%)	286(23.0)	157(22.5)	129(23.6)	0.338
Obesity, n(%)	147(11.8)	93(13.3)	54(9.9)	**0.038**
Central obesity, n(%)	617(49.6)	337(48.2)	280(51.3)	0.154
PH-DM, n(%)	107(62.9)	65(67.7)	42(56.8)	0.096
Physical inactivity, n(%)	775(62.2)	412(58.9)	363(66.5)	**0.004**
CMR, n(%)	471(59.5)	419(59.9)	322(59.0)	0.387
Fruits & legumes consumption, n(%)				0.128
Low	823(66.1)	472(67.5)	351(64.3)	
High	422(33.9)	227(32.5)	195(35.7)	

Table 2:- Cardiovascular risk factor profile of the the participants

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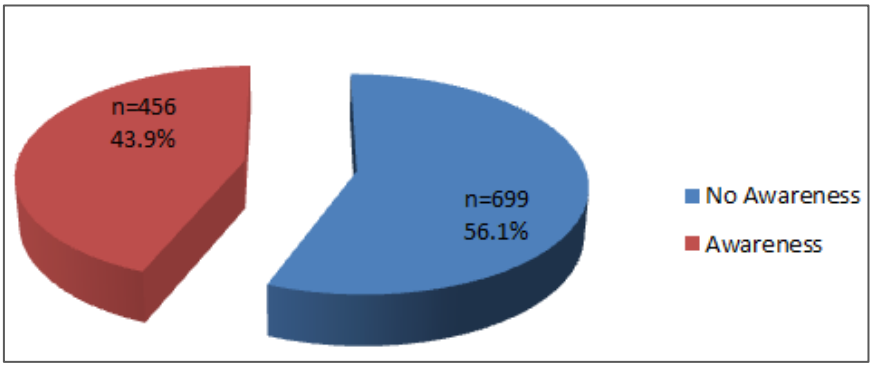

Fig 1:- Prevalence of undiagnosed of HBP

Variable	N	All	Male	Female	P
Follow up of HBP (years)		6,0(5,0-7,0)	5,0(4,0-7,0)	6,5(5,0-10,5)	0,878
Treatment, n(%)	546		150	396	0.476
No		185(33.9)	50(33.3)	135(34.1)	
Yes		361(66.1)	100(66.7)	261(65.9)	
Drug regimen/class	361		100	261	0.119
1 drug, n(%)		263(72.8)	78(78.0)	185(70.9)	
CCB		200(55.4)	54(54.0)	146(55.9)	
ACEI		43(11.9)	17(17.0)	26(10.0)	
Loop diuretic		5(1.4)	2(2.0)	3(1.1)	
ARA II		6(1.7)	1(1.0)	5(1.9)	
Betablocker		5(1.4)	2(2.0)	3(1.1)	
Thiazide-like		4(1.1)	2(2.0)	2(0.8)	
2 drugs, n(%)		98(27.2)	22(22.0)	76(29.1)	
CCB + ACEI		96(26.5)	20(20.0)	76(28.7)	
CCB +Betablocker		1(0.3)	1(1.0)	0(0.0)	
CCB + Thiazide like		1(0.3)	0(0.0)	1(0.4)	
BP control, n(%)	361		100	261	0,035
No		188(52.1)	61(61.0)	127(78.7)	
Yes		173(47.9)	39(39.0)	134(21.3)	
No BP control types, n(%)	188		64	124	0.324
Isolated systolic		23(12.2)	8(13.1)	15(13.1)	
Isolated diastolic		38(20.2)	19(26.2)	19(26.2)	
Systolic/diastolic		127(67.6)	37(60.7)	90(70.9)	

Table 3:- Treatment and control of HBP .

Variables	Univariate			Multivariate	
	p	aOR (95%CI)		p	aOR (95%CI)
Young age, yrs					
No		1			1
Yes	<0.001	1.93 (1.53-2.43)		**0.001**	1.92 (1.01-2.83)
FH-HT					
Yes		1			1
No	<0.001	3.31 (1.04-5.64)		**0.003**	3.42 (1.12-4.79)
SES					
High		1			1
Middle	0.400	1.19 (0.79-1.79)		0.520	1.14 (0.76-1.71)
Low	0.024	2.63 (1.07-3.48)		**0.012**	2.41 (1.91-3.69)
Menopause					
Yes		1			1
No	0.019	1.77 (1.38-2.27)		0.872	1. 34 (0.69-1.56)
Physical activity					
No		1			1
Yes	0.007	1.82 (1.10-2.74)		0.085	1.23 (0.97-1.57)

Table 4:- Determinants of undiagnosed HBP in logistic regression analysis.