



## Arterial Hypertension In Ivorian University Community: Prevalence And Associated Risk Factors

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### ABSTRACT

**Introduction:** Hypertension remains the main modifiable cardiovascular risk factor. It is not uncommon to find it in young black subjects.

**Objective:** The aim of this study was to assess the prevalence of hypertension in the student population of Félix Houphouët-Boigny University (FHBU) of Abidjan and to identify other associated risk factors.

**Methodology:** We conducted a community screening campaign which concerned students aged 18 to 40, from May 14 to November 14, 2018. An individual standardized questionnaire according to the model of the International Society of Hypertension (ISH) was used.

**Results:** The prevalence of hypertension was 4.1% among the 3996 students included. The mean age was  $24.2 \pm 4.1$  years with a male predominance at 66.6%. Factors significantly associated with a higher prevalence of hypertension were age ( $p = 0.000$ ), male gender ( $p = 0.000$ ) and obesity ( $p = 0.000$ ). Other associated risk factors that impacted the prevalence of hypertension were diabetes and regular alcohol consumption. Diabetes was found in 0.9% of the students of whom 13.5% were hypertensive. Regular alcohol consumption was found in 7% of the students of whom 9% were hypertensive.

**Conclusion:** HTN exists in Ivorian universities. Controlling the associated risk factors that we have identified could help reduce its prevalence.

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### Introduction

Hypertension remains the major risk factor for cardiovascular diseases worldwide.<sup>1</sup> Its overall prevalence is increasing and estimated at 30-45% in adults.<sup>2</sup> The number of people with hypertension is predicted to increase by 15-20% by 2025, to reach nearly 1.5 billion.<sup>3</sup> The prevalence of arterial hypertension gradually increases with age, exceeding 60% over 60 years old.<sup>2</sup>

Studies also suggest a high prevalence of hypertension in children and teenagers around the world with overweight and obesity as important risk factor.<sup>4</sup> Early detection and treatment may prevent the premature development of complications in adulthood.<sup>5,6</sup>

Over the past four decades, the world's highest arterial pressure levels have been recorded in low-income countries in South Asia and sub-Saharan Africa. This observation is linked to the epidemiological transition with its corollary, galloping urbanization and westernization of the lifestyle.<sup>7</sup> In addition, two-thirds of deaths from cardiovascular diseases today occur in low- and middle-income countries, representing a double burden of morbidity. Hypertension is by far the most common underlying risk factor of cardiovascular diseases in sub-Saharan Africa.<sup>8</sup>

In Côte d'Ivoire, the prevalence of hypertension was evaluated at 20.4% with poor blood pressure control in 54.4% in subjects over 18 years old.<sup>9</sup>

Academia, made up of young subjects with little financial resources, especially in our countries, probably does not

escape the burden of hypertension. However, very few studies have been done on hypertension in that population. We therefore wanted to establish the prevalence of hypertension in students at Felix Houphouët-Boigny University in Abidjan and to identify the other cardiovascular risk factors associated to it.

### Patients and methods

We conducted a community screening campaign that involved students aged from 18 to 40, from May 14 to November 14, 2018 at Felix Houphouët-Boigny University in Abidjan. Students refusing to participate in the survey were not included. The study was carried out using the May Measurement Month (MMM) model<sup>9</sup>

The data was collected on a 205 hectare campus attended by 70,000 students.<sup>10</sup> It was carried out at the site during an interrogation. We used an individual standardized questionnaire, according to the model of the International Society of Hypertension (ISH).<sup>9</sup>

Each participant benefited of 3 blood pressure (BP) measurements spaced of 5 minutes. All three measurements were carried out by the same investigator. The arterial pressure was measured on the upper part of the arms using electronic blood pressure monitors of the type OMRON M3, from the manufacturer OMRON Healthcare GmbH.

### The diagnosis of arterial hypertension was made:

- When the mean systolic blood pressure (SBP) (mean of last 2 of 3 readings) was  $\geq 140$  mmHg and / or mean diastolic blood pressure (DBP) (mean of last 2 of 3 readings) is  $\geq 90$  mmHg.
- When the student claimed to be hypertensive and to be under pharmacological treatment.

The severity of hypertension has been classified into 3 grades according to the classification of the European Society of Cardiology.<sup>1</sup>

- Grade I: mild hypertension with SBP between 140-159 mm Hg and / or DBP: 90-99 mm Hg
- Grade II: moderate hypertension with SBP: 160-179 mm Hg and / or DBP: 100-109 mm Hg
- Grade III: severe hypertension with SBP  $\geq 180$  mm Hg and / or DBP  $\geq 110$  mm Hg

Blood pressure measurement was expressed in millimeters of mercury (mmHg) and heart rate in beats per minute.

The height has been measured using a measuring rod. Weight was obtained using calibrated 1 kg scale needle scales, placed on a flat and stable surface, in barefoot subjects. The body mass index (BMI) expressed in  $\text{kg} / \text{m}^2$  is the weight divided by the square of the height. The following classification was used:

- 16 to 18  $\text{kg} / \text{m}^2$ : underweight
- 18 to 25  $\text{kg} / \text{m}^2$ : normal weight
- 25 to 30  $\text{kg} / \text{m}^2$ : overweight

- $\geq 30 \text{ kg} / \text{m}^2$ : Obesity

The other parameters were collected during interrogation on the survey sheet. These included age, gender and medical history such as diabetes, previous stroke, coronary artery disease, smoking, alcoholism and a high sodium diet.

This study complies with the ethical recommendations of the Declaration of Helsinki.<sup>11</sup> It has been approved by the national bioethics committee. All those included in the study were informed beforehand of its purpose, data confidentiality and its safety. They then gave their informed consent in writing. All data collection sheets were anonymous.

Our sampling was simple and non-probabilist. Considering a hypertension prevalence rate of 20.4%, the minimum size of our sample with a 95% confidence interval and a 5% margin of error should be 249 individuals ( $n = (1,96)^2 \times (0.204) \times (1-0.204) / (0.05)^2$ ).

Data entry was performed with Microsoft Office Excel 2013 software. Stata Data software was used for processing and statistical analysis of the data. We used the chi-square tests of PEARSON and ANNOVA, for the comparisons of proportions. The STUDENT test was used for comparisons of means, with the significance threshold set at 0.05.

### Results

Our study involved 3996 students. The mean age was  $24.2 \pm 4.1$  years old with a male predominance at 66.6%. The characteristics of the patients are summarized in Table 1. The diagnosis of hypertension was made in 164 students, for a prevalence of 4.1%. Among them 86.6% (142/164) were unaware of their status.

Among the hypertensive patients known under treatment, 77.3% (17/22) were controlled. Thirty-seven students claimed to be diabetic being 0.9% of whom 13.5% were hypertensive. Regular alcohol consumption was found in 7% of whom 9% were hypertensive.

The smoking was the fact of 85 students or 2.1% of whom 7% were hypertensive. Obesity affected 90 students, being 2.3% of whom 17.8% were hypertensive.

The analytical study looking for other cardiovascular risk factors that impacted the prevalence of hypertension, showed a significant difference for diabetes ( $p = 0.0037$ ), obesity ( $p = 0.0001$ ) and regular alcohol consumption ( $p = 0.0013$ ).

Other factors significantly associated with a higher prevalence of hypertension were age ( $p = 0.0001$ ) and sex ( $p = 0.0001$ ). The prevalence of hypertension increased with age. Male students were more hypertensive than those of the opposite sex (OR = 1.63). Active smoking did not impact the prevalence of hypertension. (Table 2).

**Discussion**

This study is the largest carried out on hypertension in a university setting in Côte d'Ivoire. It identified 142 hypertensive students who were unaware of their status.

We were able to observe a good rate of control of hypertension in students already known to be hypertensive (77.3%). This rate is clearly higher than the rate usually reported in the general population.<sup>9</sup>

The prevalence of hypertension that we were able to determine in students was 4.1%. The first study on hypertension in universities in Côte d'Ivoire is very old. It was produced in 1974 by Bertrand. It involved 496 students and found a prevalence of 1.2%.<sup>12</sup> The prevalence of 4.1% is increasing compared to Bertrand's results.

The prevalence of hypertension in this population is said to have tripled in just over 40 years. It should be noted, however, that the definition standards for hypertension have since evolved from 160/90 mmHg in the then study to 140/90 mmHg in the present study.

Studies similar to ours have reported higher prevalence. Likwela, in the Democratic Republic of Congo, in 2012 out of 490 students in health sciences, with an average age of 25.6 years old, found a prevalence of 8%.<sup>13</sup> In 2011, Ewane found among 2,658 students with an average age of 23.6 years old at the University of Douala in Cameroon, 12.7% had high blood pressure.<sup>14</sup> Das.<sup>15</sup> in 2011 at the University of Bengal in India and Wenzel.<sup>16</sup> in 2009, in a study among young Brazilian soldiers of 22 years old of average age, published prevalences 13% and 22% respectively. These observations show that the prevalence of hypertension in the student population is not negligible in our developing countries. It is in the interest of screening and treating hypertension in these learners. In addition, hypertension in children and adolescents has been shown to negatively impact the cognitive abilities of learners.<sup>17,18</sup>

Among the parameters associated with hypertension, the most potent were obesity (OR = 5.49), age (OR = 3.8) and diabetes (OR = 3.7). While age is an unchangeable risk factor, this is not the case for obesity and diabetes. In 2012, a strong link was established between hypertension and obesity in

schools in Côte d'Ivoire.<sup>4</sup> The global obesity epidemic.<sup>19</sup> requires that sufficient resources be deployed to control it because of its many consequences.

These learners could not obtain optimal academic results during their learning because of their hypertension.<sup>4</sup>

As for diabetes mellitus, its positive correlation with hypertension has been reported by numerous authors.<sup>20,21</sup> The prevalence of diabetes is growing sharply in sub-Saharan Africa due to changes in eating habits and lifestyle. The link between obesity and diabetes is also established. Managing and preventing obesity amounts to reducing the incidence of both diabetes and hypertension, thereby reducing the importance of this double burden of hypertension-diabetes in this young population.

However, some limitations should be noted in this study. Data on alcoholism, smoking, sodium consumption and the existence of diabetes were collected declaratively. It should also be noted that certain cardiovascular risk factors such as sedentary lifestyle and stress have not been evaluated. Further studies among this population of young students from the Félix Houphouët-Boigny University of Abidjan are desirable to improve our knowledge within this population.

This perspective is all the more important as research on non-transmissible diseases is a priority identified by WHO to generate evidence likely to guide policies and practices in support of public health.<sup>22</sup>

**Conclusion**

The results of our study show that the prevalence of hypertension is 4.1% at the Félix Houphouët-Boigny University in Abidjan-Cocody. This hypertension increases with age, affects males more than females, and is more often associated with obesity, diabetes mellitus, and alcohol consumption more than active smoking or a high sodium diet. This social fringe, like all low-income countries, is feeling the effects of the epidemiological transition, changes in lifestyles and styles, globalization and the aging of the population which lead to more chronic diseases. Efforts to raise awareness and take charge of these risk factors should be carried out in order to provide appropriate solutions and spare this young population, representing the future of the country.

Items	Effective	%
<b>Age (years)</b>		
[18 – 25 [	2507	62,7
[25 – 30 [	1000	25
[30- 40 [	489	12,3
<b>Sex</b>		
Male	2660	66,6

Feminine	1336	33,4
<b>Body Mass Index (kg / m<sup>2</sup>)</b>		
Thinness	524	13,1
Normal build	2946	73,7
Overweight	436	10,9
Obesity	90	2,3
<b>Tobacco consumption</b>		
Yes	85	2,1
No	3911	97,9
<b>Alcohol consumption</b>		
No consumption	3096	77,3
Moderate consumption	626	15,7
Regular consumption	279	7
<b>Sodium diet</b>		
Low sodium	274	6,9
Normosodium	3203	80,2
High salt	519	12,9
<b>Diabetes</b>		
Yes	37	0,9
No	3959	99,1
<b>Classification of hypertension</b>		
Grade 1	123	83,7
Grade 2	15	10,2
Grade 3	09	6,1

**Table 2:** Multivariate analysis using the Mentel Haenszel test of the prevalence of hypertension with other risk factors

<b>Riskfactors</b>	<b>HTN n=164</b>	<b>Non HTN n=3832</b>	<b>Odds ratio</b>	<b>IC<sub>95%</sub></b>	<b>P</b>
<b>Men</b>	<b>125</b>	<b>2535</b>	<b>1,63</b>	<b>[1,12 2,42]</b>	<b>0,0075</b>
<b>Women</b>	<b>39</b>	<b>1297</b>	<b>0,60</b>	<b>[0,41 0,87]</b>	<b>0,0075</b>
Age [25 30[	39	961	0,93	[0,62 1,35]	0,7071
<b>Age [30 40]</b>	<b>54</b>	<b>435</b>	<b>3,83</b>	<b>[2,67 5,44]</b>	<b>0,0000</b>

<b>Overweight</b>	<b>29</b>	<b>407</b>	<b>1,80</b>	<b>[1,15 2,75]</b>	<b>0,0045</b>
<b>Obesity</b>	<b>16</b>	<b>74</b>	<b>5,49</b>	<b>[2,90 9,79]</b>	<b>0,0000</b>
<b>Diabetes</b>	<b>5</b>	<b>32</b>	<b>3,73</b>	<b>[1,12 9,82]</b>	<b>0,0037</b>
Tabacco	6	79	1,80	[0,63 4,19]	0,1651
<b>Alcohol</b>	<b>54</b>	<b>851</b>	<b>1,71</b>	<b>[1,20 2,42]</b>	<b>0,0013</b>

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