

Screening, Treatment and Control of High Blood Pressure on Five Sites in Mali

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Introduction: High blood pressure is defined as blood pressure greater than or equal to 140 mm Hg for systolic and or 90 mm Hg for diastolic. It constitutes a major public health problem, the leading chronic disease in the world. The objective was to determine the prevalence, treatment rate and control of hypertension. Methods: This was a cross-sectional and descriptive study which took place over a period of 6 months in a hospital environment and in the general population. Results: Of the 1000 participants, 637 had hypertension, giving a prevalence of 63.70% with a female predominance. Thirty-three percent (33%) were unaware of their high blood pressure. The age group 60 and more was the most represented (44%). A proportion of 33 and 23.20 were overweight and obese participants, respectively. Male subjects were more overweight than female, unlike obesity which was more common among female subjects. Sixty-two percent (62%) of hypertensives were treated, of whom 44% were non-compliant. The excessively high cost and consumption of medications as needed were the main factors in therapeutic non-compliance. Twenty-two percent (22%) of all hypertensive patients and 35% of treated hypertensive patients were controlled. Women were more treated but less observant and less controlled than men. Therapeutic coverage and combination therapy rates were lower in rural areas. Hypertensives who had a high level of education were better treated and controlled than those who had no level. Conclusion: High blood pressure remains a real public health problem

in Mali. It is more common in people aged 60 and over and in females. One in three hypertensives were unaware of their hypertension. The majority received antihypertensive treatments, but only a minority of them had their hypertension controlled.

Keywords

High Blood Pressure, Screening, Control Rate, Mali

1. Introduction

High blood pressure (HBP) is a major public health problem, the leading chronic disease and the leading cause of mortality worldwide with more than 10 million deaths annually [1].

Globally, the age-standardized prevalence of hypertension among adults aged 30 to 79 years was estimated at 33%, slightly higher among men (34%) than women (32%)., it was 37% in Europe, 35% in America and 36% in Africa [2].

The prevalence in Mali was 35% (31% men and 38% women) in 2019 [2].

The number of adults with hypertension has doubled worldwide, from 650 million in 1990 to 1.3 billion in 2019 [2] of whom 82% lived in low- and middle-income regions [3]. In sub-Saharan Africa, Oceania and South Asia, most of the increase is in people without a diagnosis [3].

Worldwide, only 54% have been diagnosed with hypertension, 42% are treated and 21% are considered controlled. In Africa, 43% have been diagnosed with hypertension, 27% are treated and only 12% are controlled [2]. Low detection and treatment rates persist in the world's poorest countries, particularly in Oceania, South Asia and sub-Saharan Africa [2]. It is estimated that the number of people with hypertension will increase by 15% - 20% by 2025, reaching almost 1.5 billion [4]. With this increasing number of people suffering from hypertension, these low detection and treatment rates will shift an increasing shift of the burden of vascular and renal conditions to these regions [2].

In Mali in 2019, 53% were diagnosed with hypertension, 36% were treated and only 15% were considered to have their hypertension controlled [3]. The scarcity and age of the data motivated this study.

2. Material and Methods

This was a cross-sectional and descriptive study over a period of 6 months from February 1 to July 31, 2023. It took place in the Republic of Mali in a hospital environment (cardiology department of University Hospital Gabriel TOURE) and in the general population (Bamako-coura, a neighborhood in Bamako and Moribabougou a rural area in Kati near Bamako, 2 villages in rural area namely Massantola in Kolokani and Banankoroni in Ségou region).

All subjects aged 18 or over who agreed to participate in the study were included. Data were collected on individual survey formulas during outpatient consultations concerning the cardiology department of the Gabriel TOURE University Hospital Center and free mass consultations in public places for other sites. They included sociodemographic parameters, medical history, cardiovascular risk factors, taking antihypertensive medications, research into factors for therapeutic non-compliance, weight gain, height, blood pressure and heart rate. The data were entered using Microsoft Access software, verified using Office Excel 2016 and analyzed with SPSS 20.0.

Measurement of blood pressure (PA): BP is measured by an automatic electronic device from the Omron brand. The participant must be seated with their back supported, legs uncrossed and feet flat on the floor for at least 5 min, must not have smoked immediately before or during the measurement and must not talk during and between BP measurements.

Three measurements of BP and HR were taken in one-minute time intervals.

3. Operational Definitions

Blood Pressure is the average of the last two measurements.

Hypertension was defined as a participant with a systolic blood pressure of 140 mm Hg or more and/or a diastolic blood pressure of 90 mm Hg or more, or taking medications for high blood pressure regardless of the blood pressure measured.

Controlled hypertension was defined as blood pressure less than 140 mm Hg for systolic and less than 90 mm Hg for diastolic in a hypertensive person consuming antihypertensive medications.

Therapeutic coverage was defined as the number of treated hypertensives divided by the total number of hypertensive participants.

The control rate was defined as the number of treated hypertensives with systolic blood pressure less than 140 mm Hg and diastolic blood pressure less than 90 mm Hg divided by the total number of hypertensive participants.

The control rate among treated hypertensives is the number of treated hypertensives controlled divided by the number of treated hypertensive participants.

Combination therapy was defined as the combination of at least two antihypertensive drugs from different classes.

Monotherapy: use of a single antihypertensive drug

Dual therapy: use of two antihypertensive drugs

Triple therapy: use of three antihypertensive drugs

Quadritherapy: use of four antihypertensive drugs

Quintuple therapy: use of five antihypertensive drugs

Unknown: number of antihypertensive medications not known by the participant

BMI (ratio of weight to height squared) was used to define weight disorders:

• Underweight or thinness: BMI < 18.5 Kg/m²,

- Normal weight or normal build: BMI ≥ 18.5 and < 25 Kg/m²,
- Overweight: BMI ≥ 25 and < 30 Kg/m², Obesity: BMI ≥ 30 Kg/m².
- Overweight: BMI greater than or equal to 25 Kg/m²
- Level of study: number of years of study
- Level 0: no school attendance, Primary level: 1 to 6 years of study,
- Secondary level: 7 to 12 years of study, Higher level: more than 12 years of study.

Patient's part in cost sharing for consultations and anti-hypertension medications:

- Nothing: patient does not pay or have full coverage by insurance,
- **Part:** patient pays part,
- Fully: patient pays in full,
- Don't know: patient does not know if he is paying part or all of it.

Sedentary lifestyle was defined as a participant having less than 150 minutes of moderate exercise or 75 minutes of vigorous exercise per week.

Medication non-compliance is defined as irregular consumption of antihypertensive medication.

4. Results

During the study period, 637 participants presented high blood pressure (HBP) out of the 1000 patients consulted, i.e. a prevalence of 63.70%, among whom 33% were unaware of their high blood pressure. The female participants predominated (71%) giving a sex ratio of 0.41.

The prevalence of hypertension was 66% in women compared to 58% in men.

The age group 60 and over was the most represented (44%) followed by participants of 45-59 years (35%) (**Figure 1**). The mean age of hypertensives was 56 \pm 14 years and that of hypertension discovery 50 \pm 11 years. The mean BP was 150 \pm 24 mm Hg for systolic and 93 \pm 15 mm Hg for diastolic with a mean heart rate of 86 \pm 16 bpm.

The associated cardiovascular risk factors were dominated by a sedentary lifestyle (72%), overweight (56%), diabetes (12%) and tobacco smoking (11%) (**Figure 2**). A proportion of 33 and 23.20 were overweight and obese, respectively. Men were more overweight (37% vs 31%, p: 0.017) unlike obesity which was more common in women than men (26% vs 17% with p: 0.017) (**Figure 3**).

The prescription of antihypertensive medications was found in 62%, of whom 47% received combination therapy. Forty-four percent (44%) of treated hypertensives were non-compliant. The high cost (42.30%), consumption of antihypertensive drugs as needed (37.14%) and preference for traditional medicine (9.14%) were the main factors of therapeutic non-compliance (**Table 1**).

Twenty-two percent (22%) of all hypertensives and 35% of treated hypertensives were controlled (**Figure 4**). Treated hypertensives were better controlled by combined therapy compared to monotherapy (53% vs 44% p = 0.165), statistically not significant. Men received more combined therapy than women (60.7% vs 42% p < 0.012). Women were more treated (64% vs 57%, p: 0.108) than men but less compliant (52% vs 65%, p: 0.018) and less controlled (21% vs 23%, p value: 0.599) (Table 2).



Figure 1. Distribution of hypertensives according to age group.



Figure 2. Distribution according to associated cardiovascular risk factors.





Factors for anti-hypertension therapeutic non-compliance		Percentage	
Consumption of anti-hypertension medications as needed	65	37.14	
Side effects of anti-hypertension medications	3	1.71	
Preference of traditional medicine	16	9.14	
Difficulties obtaining anti-hypertension medications	7	4	
Forgetting to take anti-hypertension medications	10	5.71	
High cost of anti-hypertension drugs	74	42.30	
Total	175	100.0	



Figure 4. Distribution of hypertensives according to hypertension control.

	Male (%)	Feminine (%)		
Antihypertensive treatment				
Yes	57.2	64.0	0.100	
No	42.8	36.0	0.108	
Number of antihypertensive medications				
Monotherapy	18.70	33.3	p = 0.012	
Dual therapy	35.5	27. 4		
Triple therapy	21.5	12.2		
Quadritherapy	3.7	1.7		
Quintuple therapy	0.0	0.7		
Number of anti-HTA unknown	20.6	24.7		

 Table 2. Distribution according to treatment modalities according to sex.

Continued			
Regularity			
Yes	65.4	52.1	p = 0.018
No	34.6	47.9	
HTA control			
Yes	23	21.1	p = 0.599
No	77	78.9	

Table 3. Distribution according to treatment modalities based on residence.

	Urban (%)	Rural (%)		
Antihypertensive treatment				
Yes	71.4	39.7	p < 0.001	
No	28.6	60.3		
Number of antihypertensive medications				
Monotherapy	26.3	42.7		
Dual therapy	35.6	4.0		
Triple therapy	17.5	2.7		
Quadritherapy	2.5	1.3	p < 0.001	
Quintuple therapy	0.6	0		
Number of anti-HTA unknown	17.5	49.3		
Regularity				
Yes	65	16	p < 0.001	
No	35	84		
HTA control				
Yes	28.1	6.3		
No	71.9	93.7	p < 0.001	

Table 4. Distribution according to treatment modalities according to level of study.

	Level of study				
	None (%)	Primary (%)	Secondary (%)	Superior (%)	р
Anti-hypertension treatment					
Yes	57.8	58.8	73.4	71.4	0.000
No	42.2	41.2	26.6	28.6	0.009
HTA control					
Yes	18.9	22, 1	22.3	33.3	0.027
No	81.1	77.9	77.7	66.7	0.037

Therapeutic coverage was higher in urban areas compared to rural areas (71.4% versus 39.7%, p < 0.001); we also noted more combined therapy (52% vs 8%, p < 0.001), compliance (65% vs 16%, p < 0.001) and more control (28.1% vs 6.3%, p < 0.001) in urban areas compared to rural areas (**Table 3**).

Hypertensives who had a high level of education were better treated and controlled with statistically significant differences (Table 4).

5. Discussion

The prevalence of hypertension was 63.70% in our study.

In 2019, the prevalence was estimated at 33% worldwide and 36% in Africa [2].

In sub-Saharan Africa the prevalence varies from 15 to 34% depending on the study [5] [6] [7] [8].

This high prevalence of arterial hypertension in our study could be due to:

- A real increase in prevalence due to a change in behavior: poor dietary quality, rich in sodium and low in potassium, overweight, obese and a sedentary lifestyle,
- The epidemiological transition: the growth and aging of the population,
- The method of recruitment: the free nature of screening making care accessible to patients, particularly those suffering from chronic illnesses such as hypertension.

In our study, the prevalence was higher in women, in agreement with that reported by Kazem R *et al.* [9]. Unlike the WHO [2] and Ogah OS [10], who found a slightly higher prevalence of hypertension in men. This high prevalence of arterial hypertension among women in our study could be explained by the fact that in Mali women are more affected by unemployment (12.10% compared to 9.40% by men) [11] therefore they are more likely to be consulted during screenings which took place during working hours; they are also more in contact with a health establishment, which generally happens during pregnancy and associated health problems.

In our study, 33% of hypertensives did not know they were hypertensive. Biraima *et al.* [12] in Niger as well as Chobanian A V [13] in the United States of America, found respectively 53% and 30% of hypertensives who were unaware of their high blood pressure.

The age group 60 and over was the most represented in our study. This same observation was reported by Michelle C *et al.* [14]. However, in Ba HO *et al.* [15], 45 - 59-year-olds were in the majority (37%).

In our study the main cardiovascular risk factors associated with hypertension were dominated by a sedentary lifestyle (72%), being overweight (56%), diabetes (12%) and smoking (11%).

According to Whelton PK *et al.* [16], poor dietary quality, more sodium and less potassium, overweight and obesity, alcohol consumption, smoking and physical inactivity were the main risk factors for age-related increase in blood

pressure.

Men were more overweight than women (37% versus 31%, p: 0.017) unlike obesity which was more common among women than men (26% versus 17%, p: 0.017) in our study. Michelle C *et al.* [14] reported excess weight in 64.1% of patients (overweight 41.5% and obese 22.6%).

Of the 637 hypertensives, 62% received antihypertensive treatment. Worldwide, therapeutic coverage increased from 22% in 1990 to 42% in 2019 and the percentage of women suffering from high blood pressure currently treated is estimated at 47% compared to only 38% of men. It tends to be highest in high-income countries such as America (60%) and lowest in the African region (27%) [2].

In our study, combined therapy was noted in 47% of treated hypertensives. Treated hypertensives were better controlled by combination therapy compared to monotherapy. Our result is in agreement with the ESC recommendations which recommend combined therapy rather than routine monotherapy in all patients because according to a meta-analysis, the combination of hypotensive drugs from different classes is approximately 5 times more effective than doubling the dose of a single drug [17]. Chow CK *et al.* [18], reported combined therapy in 31% of treated hypertensives or 13% of all hypertensives.

In our sample, 27% of all hypertensives and 44% of treated hypertensives were non-compliant. In China, Gambia and Seychelles, only 43%, 27% and 26% respectively of patients with hypertension adhered to their antihypertensive medication regimen[19] [20] [21] [22] and in the United States, 51% of patients treated for hypertension blood pressure complied with prescriptions [23].

Only 22% of hypertensives and 35% of treated hypertensives were controlled in our study, a rate higher in men unlike the data from most studies where it was slightly higher in women as in Chow CK *et al.* [18]. The control rate was less than 13% in sub-Saharan Africa [2]. The better control of hypertension in men in our study could be explained by the fact that men received more combined antihypertensive therapy and were more compliant than women.

Similar to Chow CK *et al.* [18], low education level was associated with lower treatment and control rates in our study.

6. Conclusion

High blood pressure remains a real public health problem in Mali. It is more common in people aged 60 and over and in women.

The main cardiovascular risk factors associated with high blood pressure were dominated by a sedentary lifestyle, overweight, diabetes and smoking.

One in three hypertensives were unaware of their high blood pressure. Among those who were aware of the diagnosis, the majority received antihypertensive treatment, but only a minority were controlled.

The high cost and consumption of antihypertensive drugs as needed were the main factors for treatment non-compliance.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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