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Prevalence, Awareness, Treatment and Control of Hypertension in Residents' Sample of Luanda, Angola

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Abstract: Hypertension (HTN) is an important risk factor for cardiovascular complications and is considered a public health problem worldwide. We aimed to evaluate the prevalence, awareness, treatment and control of HTN in a population sample in Luanda, Angola. A cross-sectional study was carried out which included 1480 individuals, between May 2018 and June 2019; we recruited participants at three different points of the city. Blood pressure (BP) was measured with semi-automatic device (Omron®, EM-7131-E). For each participant, three BP measurements were taken after 5 minutes resting and the mean of the two last measurements was used for systolic and diastolic BP. HTN was defined as BP ≥140/90 mmHg or use of antihypertensive drugs. The sample included mostly young people (39.7±11.6 years old) and male (69.3%). HTN prevalence was 34.9%; 47.4% of patients were aware of their condition; 36.8% were taking medication and of these only 35.8% had BP under control. There was a positive correlation between BP and age. The prevalence of HTN was high, almost half of the patients were unaware and, among the hypertensive patients who were under medication, most of them did not have their BP under control. HTN prevalence was high; awareness, treatment and control were low.

Keywords: Arterial Hypertension; Prevalence; Awareness; Treatment; Control; Angola.

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1. Introduction

Cardiovascular Diseases (CVDs) are currently the main cause of death in the world. They were responsible for more than 17 million deaths in 2008, of which three million occurred before the age of 60, and most of them could have been prevented [1]. The World Health Organization (WHO) estimates that almost 23.6 million people will die from CVDs by 2030 [1]. Hypertension is an important risk factor for cardiac and cerebrovascular complications and is considered a public health problem worldwide. In 2000, the prevalence of hypertension in the world population was 25% and is expected to increase to 29% by the year 2025 [2].

Uncontrolled HTN is one of the main risk factors for cardiovascular disease and a significant contributor to global morbidity and mortality rates, leading to 10.5 million deaths every year [3, 4]. The expectation is that this situation will worsen despite the great advances in the pharmaceutical field regarding medications capable of controlling BP increase, due to the aging of the population and because only a minority of patients with hypertension have their BP under control (<140 mmHg SBP and <90 mmHg DBP) [5,6].

In Africa, the estimated number of people with hypertension has increased steadily from 54.6 million in 1990 to 92.3 million in 2000 (70% increase) and 130.2 million in 2010 (41% increase compared to the year 2000). It is projected to increase to 216.8 million by the year 2030 (an increase of 66% compared to the year 2010) [7]. In Angola, the prevalence of hypertension ranged from 23% to 45.2% in previous studies [8-10]. Simão et al. [8], in their study including 667 university students from the city of Lubango, south of Angola, found a prevalence of 23.5% of hypertension, being more common in men than women. Capingana et al. [9], in a study involving 615 employees from the Agostinho Neto University, Luanda, found a prevalence of hypertension of 45.2%, with no difference between men and women. Similar results were reported by Baldo et al. [10], in their study that included 609 volunteers, aged between 20 and 69 years. In a more recent screening study involving 17,481 individuals evaluated in six provinces of Angola, the prevalence of hypertension was 34.5% [11].

The main CVDs risk factors are related to the sociological environment, particularly with lifestyle or everyday behavior; they are thus deeply influenced by the culture and customs of the environment. It is this link between the sociological environment and the risk factors of CVDs, which could determine the African disparities between the rural environment, guardian of traditional culture and the urban environment, strongly influenced by Western culture [12].

The urbanization process is occurring at an increasing rate, especially in low- and middle-income countries (LMIC) [13]. Rural-to-urban migration is one of the key drivers of urbanization in LMIC and can be detrimental to population health due to changes in diet and physical activity patterns, with a consequent increase in hypertension, obesity, type 2 diabetes and cardiovascular disease [14]. Although there is no universally accepted, or applicable definition for urbanization, the phenomenon often reflects changes in political, social and economic forces, leading to considerable changes in lifestyle; such as changes in sources of livelihood, food, transportation, family structure, and environmental exposures [15].

Luanda is the main city of Angola and is the preferred destination for many citizens from different parts of the country who leave their areas of origin searching for better living conditions. The city was designed by the Portuguese conquerors to be a summer resort town and have a maximum of 500,000 inhabitants; however, it has more than six million people today [16]. Rapid urbanization, especially if unplanned, or poorly planned as it is the case of Luanda, is thought to promote development of hypertension through exposure to an environment that encourages poorer feeding habits, sedentary lifestyle, tobacco and alcohol consumption, development of obesity, and exposure to more psychological stressors [17].

The need to better understand the distribution of the problem in the population makes it essential to carry out more studies on hypertension and other risk factors to better characterize and deal with the problem. Therefore, we aimed to evaluate the prevalence, awareness, treatment and control of hypertension in sample of residents in Luanda, capital of Angola.

2. Materials and methods

2.1 Study sample

A cross-sectional study was carried out among adults living in Luanda, Angola, between May 2018 and June 2019. Aiming to target the different social strata that make up our society, we recruited participants from three different points in the city, namely: Congolenses' market, Angolan Public Television (TPA), and Xyami Shopping (Nova Vida). After getting permission from the administration's office to access the study sites, the invitation was addressed individually to the participants and all who accepted to participate were included. The protocol and consent form were approved by the institutional review board of the Department of Physiology, Faculty of Medicine, Agostinho

Neto University and all participants gave their written, informed consent. Participants with the following conditions were excluded: aged <18 years, pregnant women and who were unwilling to perform BP measurements, as well as those who refused to give the written informed consent.

2.2 Measures

A specific questionnaire was elaborated, and anthropometric and clinical data were collected directly from the participants, such as age, sex, race, residence, education and previous diagnosis of HTN, diabetes, dyslipidemia (self-referred by the patient), smoking and alcohol beverages consumption. Both height and weight were measured with an electronic scale with a built-in altimeter (SECA Medical 769 column scale, Germany). All measurements were taken with light clothes on and shoes off. Body mass index (BMI) was calculated by the following formula: weight (kg)/height (m^2).

The researchers approached all potential participants, explained the study objectives and invited them to participate. All those who accepted and signed the consent form were included. The BP measurements were taken from the participants of the study with semi-automatic device (Omron®, HEM-7131-E model) on the right upper arm, with the subject seated, after resting for 5 minutes following the recommendations of the available HTN guidelines [18]. Three BP measurements with a 1-minute interval between were used to determine SBP and DBP in each patient and the average of the two last blood pressure readings was used for the analysis. Hypertension was defined as SBP and/or DBP ≥140/90 mmHg or current use of antihypertensive drugs. Controlled hypertension was defined as blood pressure <140/90 mmHg under antihypertensive drugs.

2.3. Statistical analysis

Data were analyzed with SPSS for Windows 21.0 (IBM Corporation). Data distribution was determined using the Kolmogorov-Smirnov test. Continuous variables are presented as mean and standard deviation and categorical data are presented as percentages. Pearson coefficient was used for bivariate correlations between age and arterial blood pressure. Statistical significance was set at 5%.

3. Results

From May 2018 to June 2019, a cross-sectional study was carried out including a sample of 1480 participants recruited from three different points in the city of Luanda, capital of Angola. The general characteristics of the sample are presented in Table 1.

Table 1. General characteristics of the sample of study.

Characteristic		
Age – mean (SD)	39.7	11.6
Gender		
Male, n (%)	1025	69.3
Female, n (%)	455	30.7
Race		
Black, n (%)	1467	99.1
Other, n (%)	13	0.9
Weight – mean (SD)	71.2	14.6
Height – mean (SD)	1.7	0.9
BMI – mean (SD)	24.9	4.7
SBP – mean (SD)	128.4	19.8

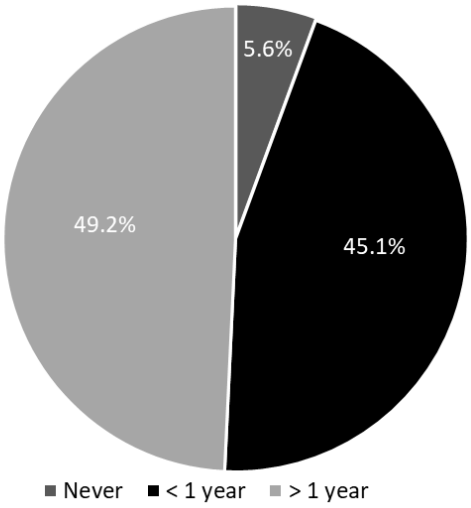
DBP – mean (SD)	81.6	13.3
PP – mean (SD)	46.9	11.5
HR – mean (SD)	75.1	11.8
Last time BP was measured?		
Never, n (%)	152	19.8
More than 1 year, n (%)	413	53.9
Less than 1 year, n (%)	201	26.2
Previous HTN diagnosis		
Yes, n (%)	250	16.9
No, n (%)	1230	83.1
Other CV risk factors		
Diabetes, n (%)	49	3.3
Smoking, n (%)	139	9.4
Alcohol consumption (%)	1104	74.6
Previous MI	21	1.4
Previous stroke	36	2.4
Classification according to BMI		
Normal, n (%)	755	55.1
Overweight, n (%)	447	30.2
Obesity, n (%)	218	14.7

Note: BMI: body mass index; BP: blood pressure; CV: cardiovascular; DBP: diastolic blood pressure; HR: heart rate; HTN: hypertension; MI: myocardial infarction; PP: pulse pressure; SBP: systolic blood pressure; SD: standard deviation.

The sample included mainly young people (mean age 39.7±11.6 years old), men (69.30%) and blacks (99.10%). Among the risk factors assessed in the sample, alcohol consumption (74.6%) and overweight/obesity (44.9%) were the most frequent. Previous diagnosis of hypertension was registered in 16.9%, smoking in 9.4% and diabetes in 3.3%. About 766 (51.8%) of the sample answered the question about the last time they had their BP checked. It was noted that 152 (19.8%) of the participants had never checked BP during their entire lives, 413 (53.9%) reported having their BP checked more than 1 year ago and 201 (26.2 %) reported having measured BP less than 1 year before the date of the assessment in the study. Restricting the same question to only hypertensive patients (Figure 1), it was registered that 15 (5.6%) hypertensive patients reported had never measured their BP throughout their lives, 131 (49.2%) patients reported they had checked their BP more than 1 year ago and 120 (45.1%) reported having their BP checked less than 1 year before the date of the assessment in the study.

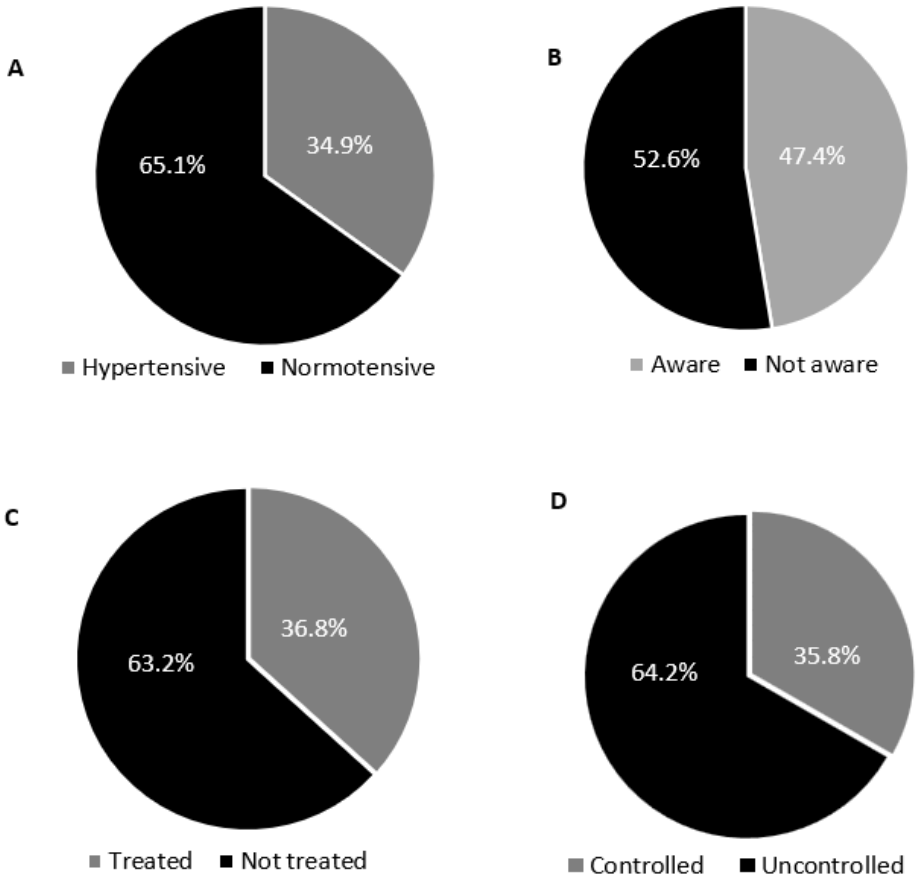
The prevalence of hypertension in the study was 34.9% (Figure 2A). Among the 517 hypertensive patients, 245 (47.4%) were aware of their condition (Figure 2B) and only 190 (36.7%) were taking medication for HTN (Figure 2C); among patients who were undergoing treatment, only 68 (35.8%) had their BP under control defined as BP <140/90 mmHg (Figure 2D). Blood pressure evolution over the years according to the patient's age increase is reported in Figure 3. As shown, both systolic blood pressure and diastolic blood pressure increases with age from the youngest ages to the fifth decade of life when there is a continuous and gradual increase in systolic blood pressure while the diastolic blood pressure tends to decrease.

Figure 1. Blood pressure measurement among patients with arterial hypertension.



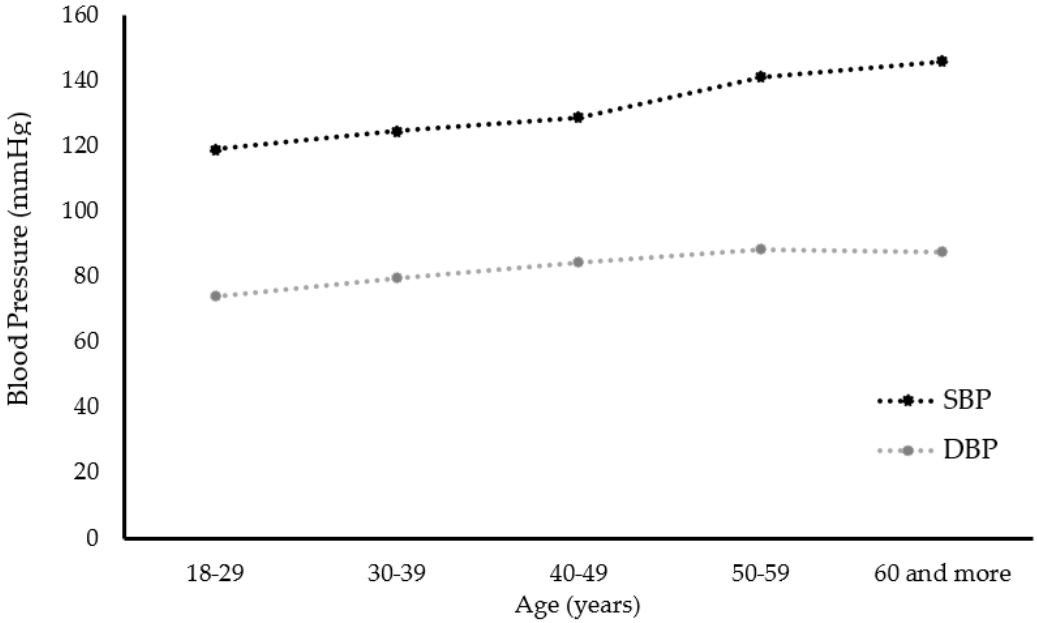
Note: Patients with hypertension responded to the question – *When was the last time you checked your blood pressure?*

Figure 2. Prevalence, awareness, treatment and control of hypertension.



Note: Figure 2A, represents the prevalence of HTN in the sample; Figure 2B, awareness among hypertensive patients; Figure 2C, treatment among hypertensive patients who were aware; and Figure 2D, control of hypertension among those patients under treatment.

Figure 3. Blood pressure variation over the years according to the patient's age increases.



Note: Blood pressure increased over the years, with a steady increase in SPB from the age of 50 and a decrease in diastolic BP from that age. DBP: diastolic blood pressure; SBP: systolic blood pressure.

4. Discussion

The mains results of the research were: (1) about one third (34.9%) of the study participants had arterial hypertension; (2) almost one fifth (19.8%) of these participants never had checked their BP throughout their lives; (3) the majority of hypertensive patients were not aware of their condition and among those who were under treatment, the majority did not have their BP under control; (4) blood pressure increased over the years until the fifth decade when it is registered the continuous increase in the SBP and a decrease in the DBP.

Data from the present study indicates a high prevalence of some risk factors such as hypertension, alcoholic beverages consumption, and overweight/obesity. The awareness of hypertension was relatively low (47.4%) and most patients undergoing hypertensive treatment did not have their BP under control (64.2%).

The prevalence of hypertension identified in the present study (34.9%) is slightly above those registered in similar studies carried out in different regions of Angola, but it is compatible with the largest study ever carried out in the country on hypertension. Some studies carried out in some regions of the country pointed to a prevalence slightly above 20%. In their study carried out in the province of Bengo, Pires et al. [19], found a prevalence of hypertension (BP ≥140/90 mmHg) of 23% (95% CI: 21% to 25.2%). Among hypertensive individuals, 21.6% were aware of their condition and only 13.9% of those who knew were undergoing pharmacological treatment, of which approximately one third had their BP under control. On the other hand, Simão et al. [8], found a prevalence of hypertension of 23.5% in a sample of 667 mostly young people. In the two largest registries on hypertension ever carried out in the country, Victoria-Pereira et al., in their first screening study included 17,481 individuals and in the second 14,433 individuals evaluated in six provinces of Angola, the prevalence of hypertension was 34.5% and 33.6% respectively [11,20]. In the first study, among the individuals who were not taking any medication, 26.3% were hypertensive. Of those receiving antihypertensive treatment, 59.7% did not have their BP under control [11]. In the second study, they found that of the total (4844) hypertensive patients, 54.2% were aware of their condition and 46.3% were undergoing antihypertensive treatment. In total, 42.6% of those on medication had BP

under control [20]. Similar results to those of the present study were reported by Muela et al., in a study on risk factors carried out among sellers at the Congolenses market in Luanda. In this study, the prevalence of hypertension was 32.1%, of which only 45.3% were aware of their diagnosis, 48.8% were undergoing treatment and only 33.3% had their BP under control [21].

The problem of low awareness about the disease among hypertensive patients, as well as the poor level of hypertension control, is a transversal problem throughout the world, being even more marked in the poorest countries. Results from the Prospective Urban Rural Epidemiology (PURE) study indicated that low-income countries have the lowest rates of awareness, treatment and control of high BP [22]. In Africa, Sub-Saharan Africa compared to North African countries has the lowest levels of awareness, treatment and control of hypertension, especially in rural areas [23]. Low awareness and poor control of hypertension in sub-Saharan Africa has been attributed to poor health infrastructure and treatment adherence, with poverty being the partially underlying cause [24].

A recent analysis of data from the WHO Stepwise Approach to Surveillance (STEPS) has shown poor hypertension care in sub-Saharan Africa [25]. The study conducted by Frøystad et al. [26], evaluated the availability and quality of health services in two provinces of Angola (Luanda and Uíge) and reported how households perceive the quality of the public health facility, from "very low" to "very high". More than half the households gave "medium quality" ranking, and one third of the household's rates quality as "low" or "very low". The quality issues that were mentioned by most people are the crowdedness of the health facilities (76.8%) and long waiting time (72.1%). These factors may discourage patients from seeking health services more frequently, especially due to the asymptomatic nature of the disease, leading to low awareness and poor control of hypertension.

In developing countries, evidence suggests that currently the impact of hypertension is very high and is exacerbated in black people mainly due to low levels of awareness and control of hypertension, onset of the disease at an increasingly younger age, and a longer duration of the disease, potentially more aggressive [27]. A rapid and pragmatic measure to deal with this reality is the increase in screening campaigns for diseases such as hypertension, diabetes and dyslipidemia.

Many other factors have contributed to the poor control of hypertension throughout the world, especially in developing countries. In a study carried out in Ribeirão Preto, Brazil, on the main difficulties for good adherence in hypertensive elderly people followed in a specialized Geriatrics outpatient clinic, the authors noted that the financial factor was the reason most mentioned by the participants, with 60% not purchasing all medication and 33.3% not buying at all. Furthermore, 80% of participants reported not understanding the doctor's handwriting and 40% did not understand the prescription itself [28].

Poverty negatively impacts access to health services, treatment compliance and hypertension control. As of 2022, over 15.1 million people in Angola lived in extreme poverty, with the poverty threshold at 1.90 U.S. dollars daily [29]. The number of poor people in the country has been following an upward trend. In 2016, there were around 10 million Angolans in extreme poverty; by 2026, it would increase to 16.3 million [29]. Angola's capital, Luanda, is a city of stark inequalities and contrasts. While it offers opportunities and wealth for the few, people in the informal slum are effectively trapped in poverty through limited income opportunities and material deficiencies [30].

The limited awareness of hypertension among health professionals and patients, the low adherence to medication among individuals who start treatment for hypertension [31], the lack of good infrastructure to manage individuals with hypertension and the lack of coverage of public health policies [32], also contribute to inadequate hypertension control, especially in developing countries.

The consumption of alcoholic beverages in our study was high (74.6%), among the participants. Evidence indicates that alcohol abuse is a powerful cardiovascular risk fac-

tor, one of the strongest for atrial fibrillation and at least equivalent to the established risk factors for acute myocardial infarction and heart failure [33]. Several studies have reported that alcohol abuse and dependence, as well as other risk behaviors, cluster in contexts of poverty, residential instability, and social isolation [34]. Alcohol consumption in Angola was measured at an average of 5.85 liters of pure alcohol per capita in 2019 [35]. Beer was the source of around 3.8 liters of pure alcohol consumed per person in the country, while the demand for spirits corresponded to a consumption of nearly 1.8 liters of pure alcohol per capita [35]. Silva et al. [36], in their study on health situation of the population in Imbondeiro neighborhood, reported that 38.1% drink alcohol, and, from these, 81.2% drink it at least one or two times a week, 13.6%, between two and four times a week, and 4.2% more than four times a week.

Globally, alcohol consumption contributes to 3 million deaths each year as well as disability and poor health for millions of people. Overall, alcohol abuse is responsible for 5.1% of deaths worldwide [37]. The possible effects of alcohol consumption on BP still raise interesting debates. A study of New York residents [38] found no consistent association between alcohol consumption and risk of hypertension in North American consumers of beer, wine, or spirits. In the cross-sectional study in Chinese men that examined the association between alcohol consumption and isolated systolic, isolated diastolic and combined systolic and diastolic hypertension, they found that those with the highest consumption (≥30 drinks/week) had a twice as high risk of developing hypertension than non-consumers, with population-attributable risks of 13.8%, 12% and 13.4% respectively [39]. Another study that included Japanese men based on total consumption of beer, sake, shochu (traditional Japanese drink), whiskey or wine [40] showed that BP was higher in the shochu group, but an analysis adjusted for total alcohol consumed found no statistical difference.

On the other hand, the present study registered a combined prevalence of overweight/obesity of 44.9% among the participants. Obesity coexists with a wide variety of cardiovascular risk factors and has been related to increased cardiovascular risk in a wide variety of observational studies [41]. Evidence indicates that the prevalence of obesity has increased worldwide and is considered an important risk factor for hypertension. The prevalence of hypertension has been positively correlated with the proportion of participants who are overweight/obese [42].

About 16% of adults aged 18 years and older worldwide were obese in 2022. The worldwide prevalence of obesity more than doubled between 1990 and 2022. Once considered a high-income country problem, overweight is on the rise in low- and middle-income countries [43]. Evidence suggests that rural-urban migration significantly and positively predicted being overweight, and the association was significantly stronger among women than men [44]. These findings may explain, in part, the high prevalence of overweight/obesity noted in our study, as a great number of people in Luanda are from other parts of the country, and often rural ones.

Data from the Framingham study have indicated that both overweight and obesity are strongly associated with the risk of hypertension in both men and women. The relative risk (RR) ranged from 1.5 to 1.7 for overweight and 2.2 to 2.6 for obese people [41]. The corresponding population-attributable risk (PAR) estimates were greatly increased, and BMI of 25 kg/m2 or more accounted for approximately 34% of the risk of hypertension in men and 62% of hypertension in women. Other factors, especially excessive alcohol consumption and estrogen in women, have been shown to increase the risk of hypertension, but the impact on the population is smaller because the prevalence of each factor is low [45].

The data from the present study also demonstrated a positive correlation between age and blood pressure (SBP: $r= 0.41$; $p<0.001$ and DBP: $r= 0.39$; $p<0.001$), with a gradual and incremental increase in both SBP and DBP until around the fifth decade of life when a continuous and gradual increase in SBP continues, while DBP tends to decrease. Similar

evidence linking increased blood pressure with age has been demonstrated in several studies [46,47].

The physiological changes associated with aging lead to an increase in systolic blood pressure, mean arterial pressure, pulse pressure, and a decreased ability to respond to abrupt hemodynamic changes [48]. The increase in blood pressure seen with aging is more related to arterial changes. Aging results in narrowing the vessel lumen and stiffening of the vessel walls through a process known as arteriosclerosis that leads to structural changes including increased vascular calcification causing early pressure reflection waves during arterial pressure wave propagation. The pressure wave arrives back from the aortic root during the systole and contributes to the increase in systolic blood pressure. Diastolic blood pressure tends to increase until around the age of 50 due to an increase in arteriolar resistance. The stiffening of the large arteries that occur in older age contributes to higher pulse pressure including a decrease in diastolic blood pressure. The increase in arteriolar resistance along with the stiffening of the large arteries leads to a significant increase in systolic blood pressure, pulse pressure and mean arterial pressure [46,47]. Data from the Framingham study have previously shown that normal BP and high normal BP often progress to hypertension over a 4-year period, especially in older adults and especially those over 65 years of age [49].

5. Conclusions

The results of this work allow us to conclude that: (a) the prevalence of arterial hypertension in the studied sample was relatively high; (b) the frequency of some risk factors such as overweight/obesity and consumption of alcoholic beverages was high; (c) the majority of individuals with hypertension were unaware of their condition and only one-third of treated hypertensive patients had their blood pressure under control; (d) there was a positive correlation between the age of the participants and blood pressure. These findings highlight the increasing burden of cardiovascular risk factors among our populations and call for public health policies and practical interventions to deal with hypertension and other modifiable cardiovascular risk factors in a scenario where the burden of infectious diseases is still high.

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Conflicts of Interest: The authors declare no conflict of interest.

Supplementary Materials: None.

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