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Factors Associated with the Occurrence and Complications of Arterial Hypertension at the Sangmélima Referral Hospital—Cameroon

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Summary: Hypertension is a public health problem with serious social, economic, and health consequences. The World Health Organisation (WHO) estimates that 1 in 3 adults worldwide suffers from hypertension. In Cameroon, the prevalence of hypertension is estimated at 35%, with nearly 17,000 deaths recorded each year. This study aimed to determine the factors associated with the occurrence and complications of hypertension at the Sangmélima Referral Hospital (HRS). A total of 528 patients treated in the cardiology department of the HRS were identified between January and December 2023. The data were analyzed using SPSS 28 software. Binary logistic regression determined the *odds ratios* and 95% confidence intervals associated with each variable. Differences were statistically significant for a p-value < 0.05. At the HRS, the annual incidence of hypertension was 16.13%. Hypertension was present in 78.8% of patients. The factors associated with the occurrence and complications of hypertension were age (OR=1.028; p=0.003), level of education (OR=15.49; p=0.023), marital status (OR=3.859; p=0.04), hypercholesterolemia (OR=2.856; p=0.01), monthly income (OR=0.882; p=0.026), number of dependents (OR=1.231; p=0.025), food security (OR=16.666; p<0.001), tobacco consumption (OR=8.592; p=0.041), fruit and vegetable consumption (OR=0.027; p=0.031), salt/sugar consumption (OR=8.129; p<0.001), place of residence (OR=4.794; p=0.005), access to essential technologies (OR=8.851; p=0.002), and use of traditional care (OR=3.137; np=0.032). HTA at the HRS is associated with several factors. In order to limit the impact of hypertension, it is crucial to emphasize improving socioeconomic and health conditions.

Keywords: Arterial hypertension; Cardiovascular diseases; Associated factors; Sangmélima referral hospital

1. Introduction

Hypertension is responsible for more than 10 million preventable deaths worldwide each year. Low- and middle-income countries suffer the most, with an increase in cases of uncontrolled hypertension and deaths from cardiovascular disease (CVD). [1]. Hypertension is a chronic disease associated with abnormally high blood pressure in the blood vessels. If left uncontrolled,

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hypertension is one of the main risk factors for cardiovascular, cerebrovascular, and neurodegenerative diseases[2]. Age, family history, and the coexistence of other pathologies, such as diabetes or kidney disease, can increase the risk of hypertension. However, this risk can also be increased by modifiable risk factors such as a diet high in salt, saturated fats, and trans-fatty acids, insufficient consumption of fruit and vegetables, a sedentary lifestyle, tobacco and alcohol consumption, and being overweight or obese[1–3].

Worldwide, the prevalence of hypertension varies according to region and income group. In sub-Saharan Africa, prevalence rates vary from 25% to 35% among adults aged 25 to 64, and some studies show that there is a direct link between blood pressure levels, salt consumption, fat consumption, and body weight. [4].

Although the epidemiological situation of hypertension in Cameroon is poorly documented, there are studies showing associations between P.H. and other chronic diseases. [5]. A 1998 study found a prevalence of hypertension of 18.5% in men and 12.6% in women [6]. This figure rose to 25% in the general population in 2012 [7]. In 2015, the national prevalence of hypertension rose to 29.7%. Today, hypertension is on the rise in Cameroon, affecting almost 35% of the adult population[8]. In the southern region, and particularly in the town of Sangmélima, the consumption of alcohol and narcotics is excessive due to the proximity of the borders. In addition, eating habits are not very diverse and are highly Westernized. A large proportion of the population (around 40%) is unaware of prevention knowledge, attitudes, and practices. [9]. All of these factors increase the incidence of cardiovascular disease (CVD) and hypertension, particularly in urban areas, even among young people. [10].

At the Sangmélima Reference Hospital (HRS), the arrival of a cardiologist in 2018 has improved diagnosis and revealed a high incidence of cardiovascular disease in the locality. The number of consultations for CVD-related causes (including hypertension) rose from 157 in 2018 to 625 in 2023[11]

The influence of multiple traditional therapies, social networks, prolonged drug shortages in hospitals, poverty and illiteracy among the population complicates this situation. [9] This situation is further complicated by the influence of multiple traditional therapies, social networks, prolonged drug shortages in hospitals, and the poverty and illiteracy of the population.

Despite the growing incidence of CVD in the locality, there is a scarcity of data that would lead to the development of policies promoting healthy lifestyles and improved socioeconomic and health conditions [8]. The present study aimed to determine the factors associated with the onset and complications of hypertension in HRS.

2. Materials and Methods

This retrospective cohort study records data on 528 patients treated in the cardiology department of the HRS between January and December 2023. The variables of interest were sociodemographic, clinical, socioeconomic, behavioral, socio-cultural, and health-related.

Data was collected in two complementary phases. The first (passive) phase consisted of a census of the medical records of eligible patients, followed by the collection of quantitative data, and the second (active) phase involved individual, structured telephone interviews with participants to collect qualitative data not contained in the records.

The data were analyzed using SPSS 28 software. The Chi-2 test was used to compare frequencies and Cramer's V to measure the magnitude of the association with each variable. Binary logistic regression was used to estimate *odds ratios* and 95% confidence intervals associated with each variable. Differences were statistically significant at a p-value < 0.05.

Obtaining institutional ethical clearance, authorization for data collection, and participants' free and voluntary participation were among the main ethical considerations. Data collection lasted 03 months from January 2024.

3. Results

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3.1. Univariate Descriptive Analysis

3.1.1. Sociodemographic Factors

Socio-demographically, the participants ranged in age from 13 to 92 years and were predominantly female (58%). The average age was 59.46 ± 15.35 years; the average weight was 72.34 kg; the average height was 1.66 m, and the average number of dependent children was 6. 50.6% of the participants were married; primary education was the most common level with 62.7% (Table 1, Figures 1, 2, 3 and 4).

Table 1. Distribution of sociodemographic factors in the study population.

SOCIODEMOGRAPHIC FACTORS		FREQUENCY (n)	PERCENTAGE (%)	CUMULATIVE PERCENTAGE (%)
SEX	Men	222	42,0	42,0
	Woman	306	58,0	100,0
	Total	528	100,0	
MARITAL STATUS	Single	136	25,8	25,8
	Married	267	50,6	76,3
	Widowed	110	20,8	97,2
	Divorce	15	2,8	100,0
	Total	528	100,0	
STUDY LEVEL	No	12	2,3	2,3
	Primary	331	62,7	65,0
	Secondary	112	21,2	86,2
	Superior	73	13,8	100,0
	Total	528	100,0	

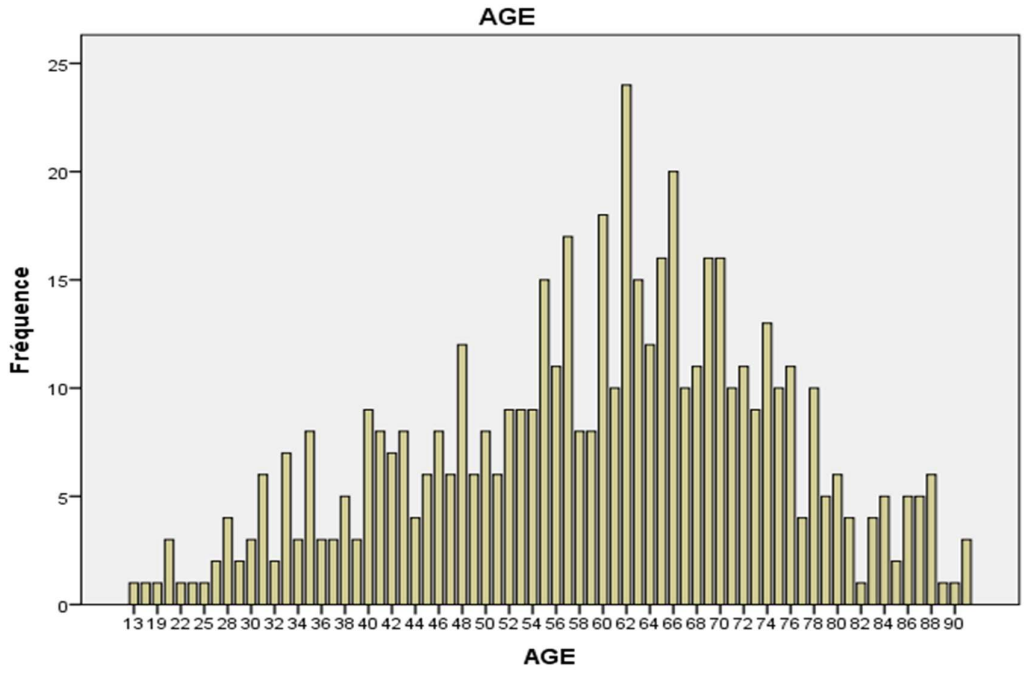

Figure 1. Age distribution of the study population.

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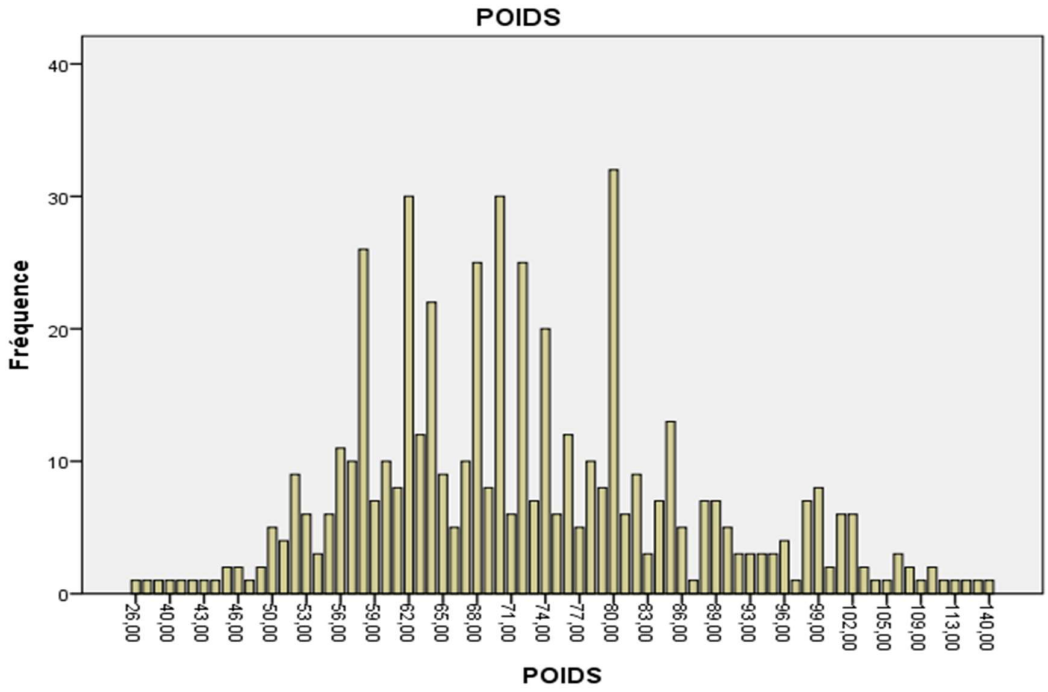

Figure 2. Weight distribution of the study population.

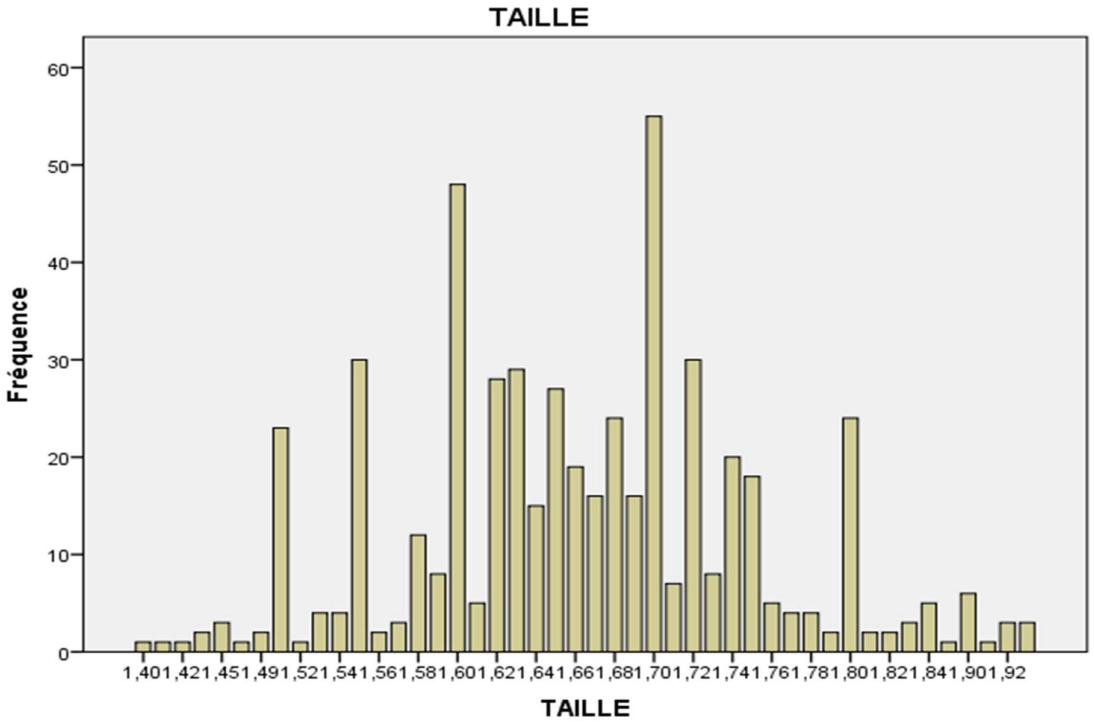

Figure 3. Size distribution of the study population.

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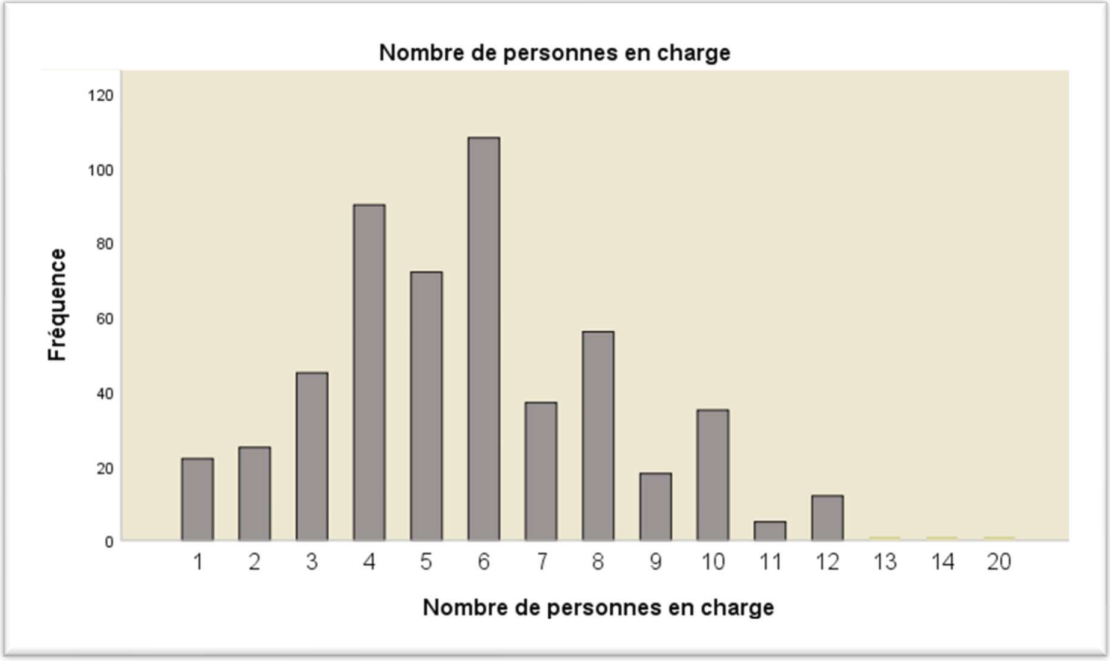

Figure 4. Breakdown of the study population's number of people in charge.

3.1.2. Clinical and Metabolic Factors

Clinically and metabolically, 78.8% of the participants were hypertensive, 20.6% were obese, 10% were diabetic, and 18% had hypercholesterolemia (Table 2).

Table 2. Distribution of clinical and metabolic factors in the study population.

CLINICAL AND METABOLIC FACTORS		FREQUENCY (n)	PERCENTAGE (%)	CUMULATIVE PERCENTAGE (%)
DIABETICS	No	475	90.0	90.0
	Yes	53	10.0	100.0
	Total	528	100.0	
HYPERTENTION	No	112	21.2	21.2
	Yes	416	78.8	100.0
	Total	528	100.0	
BODY MASS INDEX (BMI)	Slim	32	6.1	6.1
	Normal	217	41.1	47.2
	Overweight	170	32.2	79.4
	Obese	109	20.6	100.0
	Total	528	100.0	
HYPERCHOLES-TEROLEMIA	No	433	82.0	82.0
	Yes	95	18.0	100.0
	Total	528	100.0	

3.1.3. Socioeconomic Factors

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In socioeconomic terms, 18% of participants were retired; 54.7% of patients had a monthly income of between 50,000 and 100,000 FCFA. The average number of dependents was 6, so 84.8% of food requirements were insufficient (Table 3).

Table 3. Distribution of socioeconomic factors in the study population.

SOCIOECONOMIC FACTORS		FREQUENCY (n)	PERCENTAGE (%)	CUMULATIVE PERCENTAGE (%)
PROFESSION	Government employee	66	12.5	12.5
	Private sector employee	48	9.1	21.6
	Self-employed	44	8.3	29.9
	Farmer	101	19.1	49.1
	Breeder	9	1.7	50.8
	Retailer	55	10.4	61.2
	Pupil / Student	19	3.6	64.8
	Retired	95	18.0	82.8
	Housekeeper	79	15.0	97.8
	Unemployed	12	2.2	100.0
	Total	528	100.0	
MONTHLY INCOME	Less than 50 000F	75	14.2	14.2
	Between 50 and 100.000F	289	54.7	68.9
	Between 100 and 200.000F	129	24.4	93.4
	Between 200 and 300.000F	29	5.5	98.9
	More than 300.000F	6	1.1	100.0
	Total	528	100.0	
NUMBER OF PEOPLE IN CHARGE	1	22	4.2	4.2
	2	25	4.7	8.9
	3	45	8.5	17.4
	4	90	17.0	34.5
	5	72	13.6	48.1
	6	108	20.5	68.6
	7	37	7.0	75.6
	8	56	10.6	86.2
	9	18	3.4	89.6
	10	35	6.6	96.2
	11	5	0.9	97.2
	12	12	2.3	99.4
	13	1	0.2	99.6
	14	1	0.2	99.8
	20	1	0.2	100.0
	Total	528	100.0	
FOOD SAFETY	Insufficient	448	84.8	84.8
	Sufficient	80	15.2	100.0
	Total	528	100.0	

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3.1.4. Behavioural Factors

In terms of behavior, 5.7% of participants regularly smoked, 33.7% regularly drank alcohol, 26.1% played sports weekly, 22.3% regularly ate fruit and vegetables, and 62.7% regularly ate salty or sweet foods (Table 4).

Table 4. Distribution of behavioral factors in the study population.

BEHAVIOURAL FACTORS		FREQUENCY (n)	PERCENTAGE (%)	CUMULATIVE PERCENTAGE (%)
TOBACCO CONSUMPTION	No	453	85.8	85.8
	Former smoker	33	6.3	92.0
	Occasional smoker	12	2.3	94.3
	Regular smoker	30	5.7	100.0
	Total	528	100.0	
ALCOHOL CONSUMPTION	No	91	17.2	17.2
	Former consumer	33	6.3	23.5
	Occasional consumer	226	42.8	66.3
	Regular consumer	178	33.7	100.0
	Total	528	100.0	
PRACTISING SPORT	No	125	23.7	23.7
	Former practitioner	62	11.7	35.4
	Occasional user	203	38.4	73.9
	Weekly user	138	26.1	100.0
	Total	528	100.0	
FRUIT AND VEGETABLE CONSUMPTION	No	1	0.2	0.2
	Former consumer	3	0.6	0.8
	Occasional consumer	406	76.9	77.7
	Regular consumer	118	22.3	100.0
	Total	528	100.0	
SALT/SUGAR CONSUMPTION	Former consumer	8	1.5	1.5
	Occasional consumer	189	35.8	37.3
	Regular consumer	331	62.7	100.0
	Total	528	100.0	

3.1.5. Environmental and Cultural Factors

Regarding environment and culture, 75.8% of participants live in urban areas, 95.5% of patients are Christian, and 81.3% belong to the Fang-Beti cultural area (Table 5).

Table 5. Distribution of environmental and cultural factors in the study population.

ENVIRONMENTAL AND CULTURAL FACTORS	FREQUENCY (n)	PERCENTAGE (%)	CUMULATIVE PERCENTAGE (%)

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PLACE OF RESIDENCE	Urban	400	75.8	75.8
	Semi-urban	52	9.8	85.6
	Rural	76	14.4	100.0
	Total	528	100.0	
RELIGION	Christian	504	95.5	95.5
	Muslim woman	21	4.0	99.4
	Other	3	.6	100.0
	Total	528	100.0	
CULTURAL AREA	Fang-Beti	429	81.3	81.6
	Sudan-Sahel	16	3.0	84.3
	GrassFields	60	11.4	95.6
	Sawa	8	1.5	97.2
	Other	15	2.8	100.0
	Total	528	100.0	

3.1.6. Health Factors

In terms of health, the most frequently diagnosed complications of hypertension were hypertensive heart disease (48.5%), followed by ischaemic heart disease (25.2%), heart failure (10.3%) and stroke (4.9%). In addition, of the 528 participants surveyed, 21.2% of CVD were diagnosed early, 93.2% of participants had access to essential medicines, 90% of participants had access to therapeutic education, 83.3% of participants had access to essential technologies, and 17.4% used traditional care at the same time (Table 6).

A descriptive analysis of our sample shows that homemakers aged around 60 with primary education are the most affected by hypertension. Overall, hypertension is present in 78.8% of participants, 84.8% of whom live in unfavorable socioeconomic conditions. Of these, 75.8% live in urban areas, and 62.3% regularly consume salty or sugary foods. 78.6% of diseases are detected late and, despite this, 17.4% resort to traditional care.

Table 6. Distribution of complications of hypertension and health factors in the study population.

HEALTH FACTORS		FREQUENCY (n)	PERCENTAGE (%)	CUMULATIVE PERCENTAGE (%)
COMPLICATIONS OF HTA	Hypertensive heart disease	255	48.3	48.3
	AVC	26	4.9	53.2
	Heart failure	54	10.3	63.5
	Ischaemic heart disease	133	25.2	88.7
	Other	60	11.3	100.0
	Total	528	100.0	
EARLY DETECTION	No	416	78.8	78.8
	Yes	112	21.2	100.0
	Total	528	100.0	
ACCESS TO TECHNOLOGY	No	439	83.1	83.1
	Yes	89	16.9	100.0
	Total	528	100.0	

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ACCESS TO MEDICINES	No	36	6.8	6.8
	Yes	492	93.2	100.0
	Total	528	100.0	
ACCESS TO THERAPEUTIC EDUCATION	No	53	10.0	10.0
	Yes	475	90.0	100.0
	Total	528	100.0	
RECOURSE TO TRADITIONAL CARE	No	436	82.6	82.6
	Yes	92	17.4	100.0
	Total	528	100.0	

3.2. Bivariate Analysis

3.2.1. Sociodemographic Factors

In terms of socio-demographics, age was strongly associated with the onset of hypertension among the participants surveyed, while marital status, level of education, and gender were weakly associated with hypertension among the participants surveyed (Figure 5).

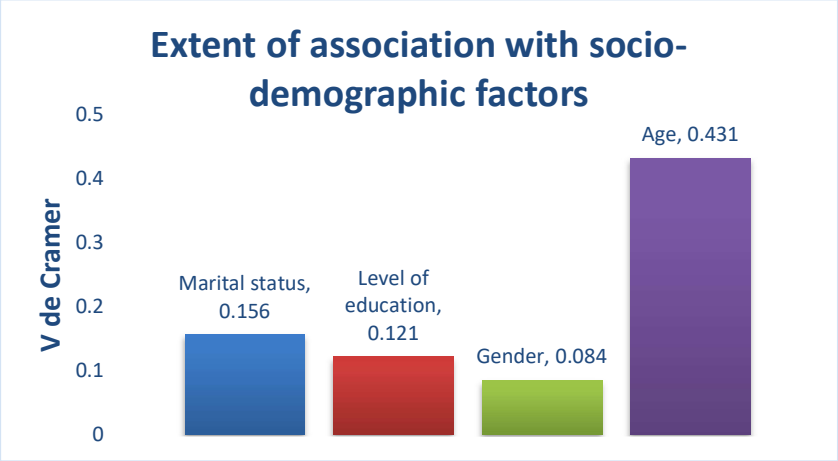

Figure 5. Extent of association between hypertension and sociodemographic factors.

3.2.2. Clinical and Metabolic Factors

In clinical and metabolic terms, there was no association between the variables weight, height, and BMI of the participants and hypertension. On the other hand, there was a weak association between hypertension, diabetes, and hypercholesterolemia, respectively among the participants surveyed (Figure 6).

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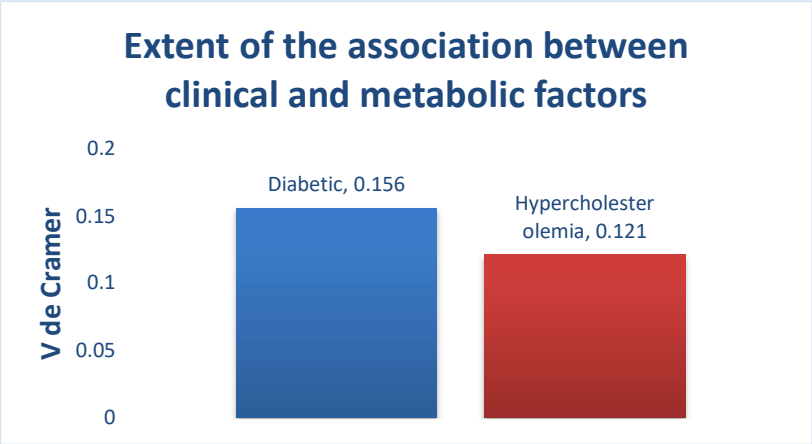

Figure 6. Extent of association of hypertension with clinical and metabolic factors.

3.2.3. Socioeconomic Factors

Regarding socioeconomic status, there was a moderate association between hypertension and occupation and a weak association between hypertension, participants' income, and food security among the participants surveyed (Figure 7).

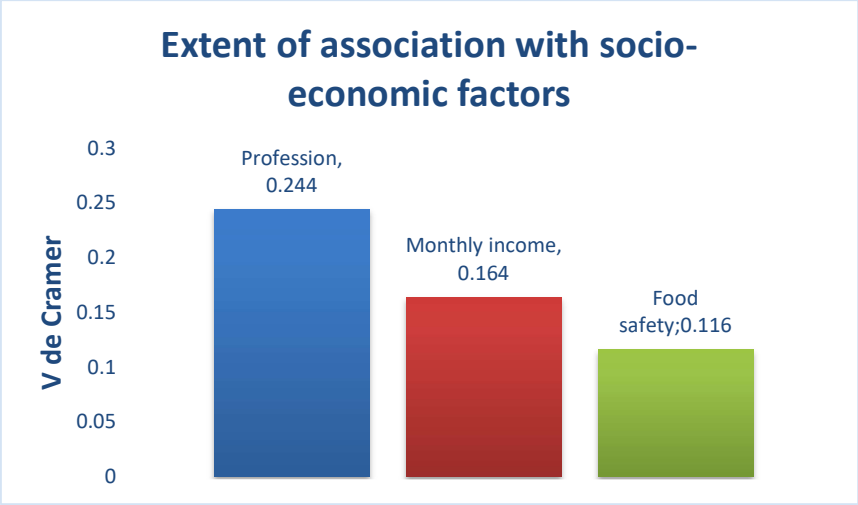

Figure 7. Extent of association between hypertension and socioeconomic factors.

3.2.4. Behavioural Factors

At the behavioral level, there was no association between hypertension and alcohol consumption among the participants identified. There was a weak association between hypertension and smoking, physical activity and fruit and vegetable consumption, and a moderate association between hypertension and salt or sugar consumption among the participants surveyed (Figure 8).

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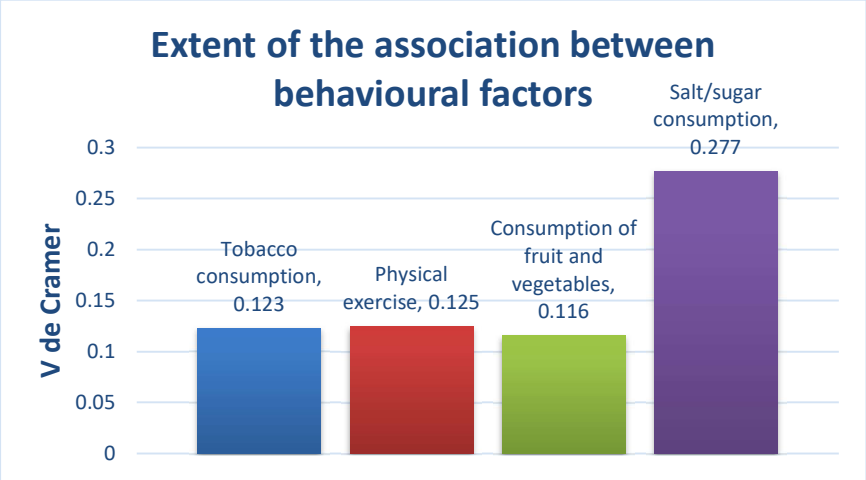

Figure 8. Extent of association between hypertension and behavioral factors.

3.2.5. Environmental and Cultural Factors

Regarding the physical and socio-cultural environment, there was no association between hypertension and the various independent variables tested in our sample (cultural area, place of residence, and religion).

3.2.6. Health Factors

Regarding health, there was no association between hypertension, access to early detection, and use of traditional care. There was a moderate association between hypertension, access to essential technologies, and access to essential medicines, respectively, and a weak association between hypertension and access to therapeutic education among the participants identified (Figure 9).

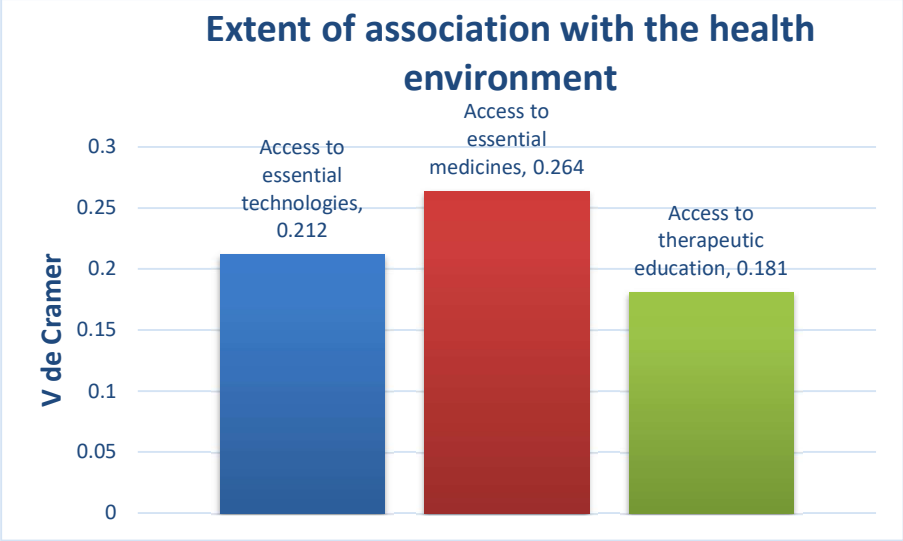

Figure 9. Extent of the association of hypertension with the health environment.

Finally, the bi-variate analysis of our sample shows that :

- The variable most strongly associated with the onset of hypertension is age;
- The variables moderately associated with the onset of hypertension are hypercholesterolemia, occupation, salt/sugar consumption, access to technology and essential medicines;

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- The variables weakly associated with the onset of hypertension are sex, marital status, level of education, diabetes, monthly income, food security, smoking habits, physical activity, fruit and vegetable consumption, and access to therapeutic education.

3.3. Multivariate Analysis

Binary logistic regression showed that the null model (beginning block) predicted a risk of hypertension with an accuracy rate of 78.8% in the absence of associated factors. Furthermore, this model is significant at 0.001, with an association constant of 1.312 and a standard error of 0.106.

When the variables analyzed were included in the model, age, level of education, hypercholesterolemia, occupation, number of dependents, food security, fruit and vegetable consumption, salt/sugar consumption, place of residence, access to essential technologies and use of traditional care proved significant with different strengths of association (adjusted OR) (Table 7, Figure 10). Including these variables increases the significance of the model with a Chi-square of 293.070 and an accuracy rate of 89.6%. Among these factors :

- **The protective factors (OR < 1) against the onset of hypertension** are: monthly income consumption of fruit and vegetables (0.976).
- **The risk factors (OR > 1) for the development of hypertension are**: age (0.028); marital status (3.859); hypercholesterolemia (2.856); level of education (15.494); number of dependents (0.231); food security (16.666); tobacco consumption (8.592); salt or sugar consumption (8.129); place of residence (4.794); access to essential technologies (8.851); use of traditional care (3.137);

Table 7. Factors associated with the onset or complications of hypertension: results of multivariate analysis.

Factors	Associated variables	Adjusted OR	95% CI	p-value
Sociodemographic factors	Gender	1.436	[0.662-3.115]	0.359
	Age	**1.028**	**[1.010-1.047]**	**0.003**
	Weight	1.019	[0.957-1.085]	0.554
	Size	1.047	[0.002-707.287]	0.989
	Marital status	**3.859**	**[1.066-13.965]**	**0.040**
	Level of education	**15.494**	**[1.235-194.307]**	**0.034**
Clinical and metabolic factors	Diabetic	1.640	[0.371-7.258]	0.514
	Body Mass Index	1.038	[0.776-1.390]	0.307
	Hypercholesterolemia	**2.856**	**[1.290-6.326]**	**0.010**
Socioeconomic factors	Profession	1.252	[0.868-1.612]	0.961
	Monthly income	**0.882**	**[0.790-0.985]**	**0.026**
	Number of people in charge	**1.231**	**[1.027-1.477]**	**0.025**
	Food safety	**16.666**	**[3.464-80.179]**	**0.001**
Behavioral factors	**Tobacco consumption**	**8.592**	**[1.095-67.432]**	**0.041**
	Alcohol consumption	1.118	[0.837-1.493]	0.452
	Physical activity	0.997	[0.687-1.446]	0.987
	Consumption of fruit and vegetables	**0.027**	**[0.001-0.713]**	**0.031**
	Salt/sugar consumption	**8.129**	**[2.948-22.410]**	**0.001**
Physical and cultural environment	**Place of residence**	**4.794**	**[1.588-14.477]**	**0.005**
	Religion	0.718	[0.233-2.211]	0.564
	Cultural area	0.970	[0.675-1.393]	0.869

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Health environment	Early detection	1.121	[0.377-3.336]	0.837
	Access to essential technologies	**8.851**	**[2.284-34.293]**	**0.002**
	Access to essential medicines	6.334	[0.785-51.094]	0.083
	Access to therapeutic education	0.360	[0.064-2.031]	0.247
	Use of traditional treatments	**3.137**	**[1.106-8.896]**	**0.032**

NB: The significant variables in the binary logistic regression model are in bold. The p-value is significant at 0.05. OR (Odds Ratio) measures the strength of the association between variables. 95% CI: Confidence interval of the measure.

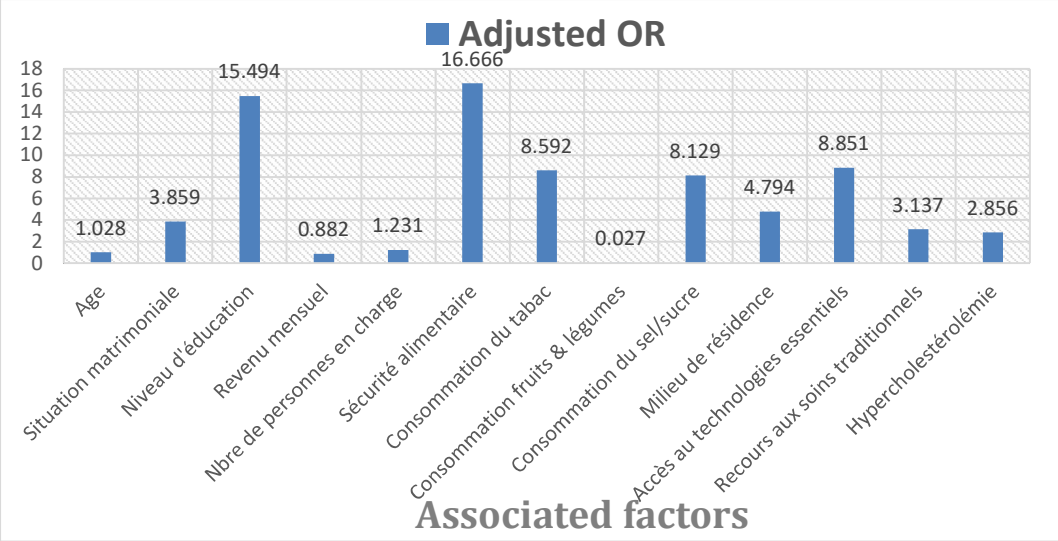

Figure 10. Summary of factors associated with the onset/complications of hypertension.

4. Discussion

4.1. The Incidence of Arterial Hypertension and Its Main Complications at Sangmélima Referral Hospital

The HRS 2023 annual activity report shows that 625 patients were seen in the cardiology department out of 3,875 outpatients and 6,977 overall hospitalizations [9]. This represents an annual incidence of 16.13% for outpatients and 8.96% for inpatients. Among the 528 participants in our study, hypertension was present in 416 (78.8%) cases. The most frequently diagnosed complications of hypertension were hypertensive heart disease (48.5%), followed by ischaemic heart disease (25.2%), heart failure (10.3%) and stroke (4.9%). These results show that CVD is one of the major causes of consultation and hospitalization in our context. These results are in agreement with Vernay M et al., who revealed that cardiovascular disease is the second leading cause of mortality in Cameroon, with an estimated case-fatality rate of 8.6%. [12,13].

Furthermore, 13.7% of all deaths are attributed to hypertension. Unfortunately, these figures are set to rise with urbanization, the westernization of diets, and the aging of the population. Complications of hypertension are still dominated by hypertensive heart disease (48.5% in our study), which confirms that hypertension is both a CVD and a risk factor for aggravation and complication of other CVD.[14].

4.2. Sociodemographic Factors Associated with the Onset of Arterial Hypertension at Sangmélima Referral Hospital

Several studies have shown the association between sociodemographic factors and the onset of hypertension[15,16]. In our study, the sociodemographic variables associated with the onset of hypertension were age, marital status, and level of education. The literature shows that the incidence

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of hypertension increases with age [17]. Less than 10% of 18-34 year-olds are affected, compared with more than 65% after 65. Aging promotes loss of elasticity in the arteries and is the main non-modifiable risk factor. In our context, age is also associated with the onset of hypertension, with an odds ratio of 1.028. This means increasing age by one year increases hypertension by 0.028 (2.8%).

Concerning marital status, there is an association between marital status and the onset of hypertension[18–20]. Certain groups of individuals are more likely to be victims of social exclusion or discrimination, particularly widows/widowers, and therefore more likely to develop hypertension. Some authors point out that loneliness is mainly responsible for the differences in blood pressure observed in the elderly[21]. Others have also shown a direct link between loneliness and systolic blood pressure, a relationship that increases with age[22–24]. We can, therefore, understand the influence of marital status on the onset of hypertension. In the case of our study, hypertension is multiplied by 3.859 in people living alone compared with married people.

Concerning level of education, the Knowledge, Attitudes, and Practices (KAP) studies carried out in several places establish a relationship between schooling, level of education, and hypertension. In other words, there is a direct link between hypertension control and level of education[25–27]. In the case of our study, the increase in hypertension observed among homemakers (adjusted OR = 15.494) compared with those in higher education seems to be linked to their low level of knowledge (primary education).

4.3. Clinical and Metabolic Factors Associated with the Onset of Arterial Hypertension at Sangmélima Referral Hospital

Clinically and metabolically, the variable significantly associated with the onset of hypertension is hypercholesterolemia. High cholesterol levels can reduce blood flow (hypertension) and thus increase the risk of heart attack or stroke. Hypercholesterolaemia, particularly the increase in LDL-cholesterol in the blood, is at the root of hypertension and other CVDs[28]. The results of our study show that hypertension is significantly associated with other CVDs, with a Chi-square of 0.001 and a magnitude of association equal to 0.503. This means that hypertension shares the same risk factors as diagnosed CVD.

4.4. Socioeconomic Factors Associated with the Onset of Hypertension at Sangmélima Referral Hospital

Regarding socioeconomic status, our study found that occupation, number of dependents, and food security were significantly associated with the onset of hypertension. Many risk factors or complications of hypertension are inversely associated with an individual's socioeconomic status[29]. Studies show that mortality among people with hypertension was higher in the most disadvantaged environments (22.6%) than in the most advantaged environments (16.8%)[30,31].

There is an association between occupation (income level) and food security and hypertension, especially as malnutrition in all its forms (notably undernutrition, micronutrient deficiency, overweight, and obesity) is a significant cause of morbidity and mortality linked to NCDs. Similarly, a family's income level also influences the education offered to its offspring. This being the case, many children drop out of school for lack of financial means and are therefore subject to poverty and lack of education, which is a factor associated with hypertension, with an odds ratio that is also very high (15.494)[30–32].

In our study, occupation and the number of dependents in a household act synergistically on food security, which in turn influences the occurrence of hypertension with an odds ratio of 16.666. This being the case, we can conclude that there is an inverse association between monthly income (adjusted OR = 0.882) and food security (adjusted OR = 0.060) on hypertension. This association is directly proportional to the number of dependent children (adjusted OR = 1.231).

4.5. Behavioural Factors Associated with the Onset of Arterial Hypertension at Sangmélima Referral Hospital

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In terms of behavior, consumption of tobacco, fruit, vegetables, and salt/sugar were significantly associated with the onset of hypertension, with adjusted O.R.s of 8.592, 0.027, and 8.129, respectively. This means that fruit and vegetable consumption has a protective effect of 0.973 (97.3%) on hypertension, while tobacco and salt/sugar consumption have a multiplier effect of 8.592 and 8.129, respectively, on hypertension.

Smoking increases the risk of developing several non-communicable diseases, such as cardiovascular disease, chronic respiratory disease, diabetes, and cancer. Smoking increases the risk of cardiovascular disease, in particular ischaemic heart disease, heart failure, and hypertensive disease[33]. In addition, smoking has a potentiating effect on other cardiovascular risk factors, such as hypercholesterolemia, and this risk persists even after adjustment for these factors[34,35].

Good nutrition boosts the immune system. Greater adherence to the DASH (Dietary Approach to Stop Hypertension) or Mediterranean diet benefits blood pressure. For example, fruits and vegetables provide vitamins and minerals, and the health-promoting fats contained in olives or seeds are rich in unsaturated fatty acids, which are necessary for the proper functioning of the immune response[36]. On the other hand, a diet high in saturated fats, sugars, and salt predisposes to obesity, diabetes, hypertension, and cancer. In addition, the so-called 'Western' diet (rich in fats, sugars, and carbohydrates) leads to chronic inflammation and a reduced immune response to viral infections[37]. The association between a high-fat diet in the mother can sometimes lead to hypertension in the offspring[38].

Alcohol consumption and physical activity, as identified in other studies, had no significant effect on our sample.

4.6. Socio-Cultural and Environmental Factors Associated with the Onset of Arterial Hypertension at Sangmélima Referral Hospital

In cultural and environmental terms, the environment in which people live is the only variable to significantly influence the onset of hypertension, with an adjusted OR of 4.794. An ecological study showed that an unfavorable residential context (dust, natural, and water pollution) was associated with a higher prevalence of hypertension[39]. Another study showed that the environment did not influence hypertension in the same way as education or employment. Individuals living in an intermediate environment were found to have the highest prevalence of hypertension[40]. In our study, urban residents increased hypertension by 4.794 times compared with rural residents.

4.7. Health Factors Associated with the Occurrence of Arterial Hypertension at Sangmélima Referral Hospital

In terms of health, there is an association between health systems and the onset of hypertension[41]. Blood pressure may be temporarily elevated due to stress, physical activity, or the environment in which it is measured (in a hospital, for example, this is known as the white coat effect)[42–45]. Under these conditions, two measurements per consultation during three successive consultations over three to six months are necessary to confirm a diagnosis of hypertension. Doctors, therefore, recommend monitoring blood pressure at home using an automatic blood pressure monitor. Unfortunately, very few people treated for hypertension are equipped with a self-measuring device. In the case of our study, this percentage is estimated at 16.9%.[36,37].

Furthermore, most hospitals in outlying urban centers lack qualified staff to manage hypertension and its complications[46,47]. At the same time, tests such as electrocardiograms and echocardiograms, which can detect and prevent heart problems, are expensive. This situation is complicated by the influence of multiple traditional therapies[48]. The influence of multiple traditional therapies, social networks, prolonged drug shortages in hospitals, and the poverty of the population complicates this situation. This is why recourse to traditional care is so high, estimated at 17.4% in our study. This percentage would double if we included patients who used only traditional care. Additional STEPS-type surveys, proposed by the WHO, are needed to verify this.

5. Conclusions

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The results of this study show that high blood pressure is present in 78.8% of participants, 84.8% of whom live in poor socioeconomic conditions, 75.8% of whom live in urban areas, and 62.3% of whom regularly consume salty or sugary foods. Of these, 75.8% lived in urban areas, and 62.3% regularly consumed salty or sugary foods. 78.6% of the diseases were detected late; however, 17.4% resorted to traditional care. The most commonly diagnosed complications of hypertension were hypertensive heart disease (48.5%), followed by ischaemic heart disease (25.2%), heart failure (10.3%) and stroke (4.9%).

The factors associated with the onset or complications of hypertension at the Sangmélima Referral Hospital are sociodemographic (age, level of education, marital status), clinical and metabolic (hypercholesterolemia), socioeconomic (monthly income, number of direct dependents, food security), behavioral (tobacco consumption, fruit and vegetable consumption, salt/sugar consumption), environmental (place of residence) and health (access to essential technologies for screening and monitoring the disease, use of traditional care).

Overall, the factors that appear to play a predominant role in the onset of hypertension are level of education and food security. These two variables alone are responsible for around 50% of the factors associated with the onset/complication of hypertension. It is the most vulnerable social classes (homemakers aged around 60) with the lowest incomes (< 100.000FCFA), unable to meet their dietary needs because of a high food burden, who are the most affected by hypertension. This study emphasizes socioeconomic and health factors, which are more often than not relegated to second place behind sociodemographic and behavioral factors. The prevention of these two associated factors is a matter of social epidemiology.

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Informed consent: Participants were given information about the study (objective, target). Participants' verbal consent was a condition for data collection. Participants were treated with respect and free to withdraw their consent at any time during the study.

Data availability: The data are available on reasonable request from the corresponding author, Luc ONAMBELE

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