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Research Article

Factors Associated with the Occurrence and Complications of Arterial Hypertension at the Sangmelima Referral Hospital – Cameroon

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Abstract

Hypertension is a public health problem with serious social, economic, and health consequences. The World Health Organization (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 Sangmelima Referral Hospital (SRH). A total of 528 patients treated in the cardiology department of the SRH 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 SRH, 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 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.

Kew Words: arterial hypertension; cardiovascular diseases; associated factors; Sangmelima referral hospital

1. Introduction

Hypertension is one of the leading causes of premature death and disability worldwide. It contributes to over 10 million preventable deaths annually, primarily through complications such as stroke, heart failure, myocardial infarction and kidney disease [1-3]. Although once considered a condition of high-income countries, hypertension now disproportionately affects low- and middle-income countries (LMICs), where nearly

two-thirds of cases are found [4]. Sub-Saharan Africa is particularly affected, with recent estimates suggesting that 25% to 35% of adults aged 25 to 64 are hypertensive [5,6]. Yet awareness, diagnosis, and control rates remain unacceptably low [7].

The growing burden of hypertension in Africa is largely driven by a complex interplay of factors, including population aging, rapid urbanization, lifestyle transitions, and structural weaknesses in health systems. Dietary shifts toward processed foods high in salt and sugar, physical inactivity, increased alcohol and tobacco consumption, and poor health literacy all contribute to the epidemic [8–10]. At the same time, limited access to essential diagnostic tools, preventive care, and affordable medications hampers early detection and long-term control [11].

In Cameroon, national surveys have documented a rising trend in hypertension prevalence — from 18.5% in 1998 to 29.7% in recent years [12-14]. Almost 35% of the adult population is affected; however, regional disparities persist [14-16]. In the southern region, particularly in towns like Sangmelima, socioeconomic hardship, limited dietary diversity, and reliance on traditional medicine remain common. These conditions may increase vulnerability to both hypertension and its complications, yet data on risk factors in such semi-urban settings are sparse.

Since the arrival of a cardiologist at the Sangmelima Referral Hospital (SRH) in 2018, the number of detected cases of hypertension and cardiovascular disease has markedly increased from 157 cases in 2018 to 625 cases in 2023 [17]. This shift offers a valuable opportunity to explore the individual and contextual determinants of hypertension in a high-risk population.

This study aimed to identify the sociodemographic, clinical, behavioral, environmental, and systemic factors associated with hypertension and its complications among patients treated at the SRH, in order to inform more targeted prevention and management strategies.

2. Materials and Method

This was a retrospective cohort study conducted at the Cardiology Department of the SRH, South Cameroon. The study population consisted of 528 patients managed for cardiovascular conditions between January and December 2023.

Data collection was carried out in two complementary phases. The first (passive) phase involved a review of patient medical records to extract sociodemographic, clinical, behavioral, socioeconomic, environmental, and health-related data. In the second (active) phase, structured telephone interviews were conducted with patients or caregivers to collect additional information not available in the records.

Data were entered and analyzed using SPSS version 28. Descriptive statistics were used to summarize the characteristics of the population. Associations between variables and hypertension were assessed using Chi-square tests and Cramer's V. Binary logistic regression was performed to identify independent factors associated with the occurrence and complications of hypertension. A p-value < 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Ethics Committee of the School of Health Sciences, Catholic University of Central Africa (Ref: 2024/020641/CEIRSH/ESS/MSP). The authorization for data collection was obtained from the Director of the Hospital. Verbal informed consent was also obtained from all p articipants prior to data collection. Data collection lasted 03 months from January 2024.

3. Results

3.1. Univariate Descriptive Analysis

3.1.1. Sociodemographic factors

A total of 528 patients were included, with a mean age of 59.5 ± 15.4 years (range: 13–92 years). Women represented 58% of the sample, and 62.7% had only primary level education. Most participants (50.6%) were married, with an average of six dependents per household (Table 1, Figures 1, 2, 3 and 4).

Sociodemographic Factors		Frequency (n)	Percentage (%)	Cumulative Percentage (%)
Sex	Men	222	42,0	42,0
	Women	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	None	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	

Note: Values are presented as frequencies and percentages of the study population (n = 528).

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

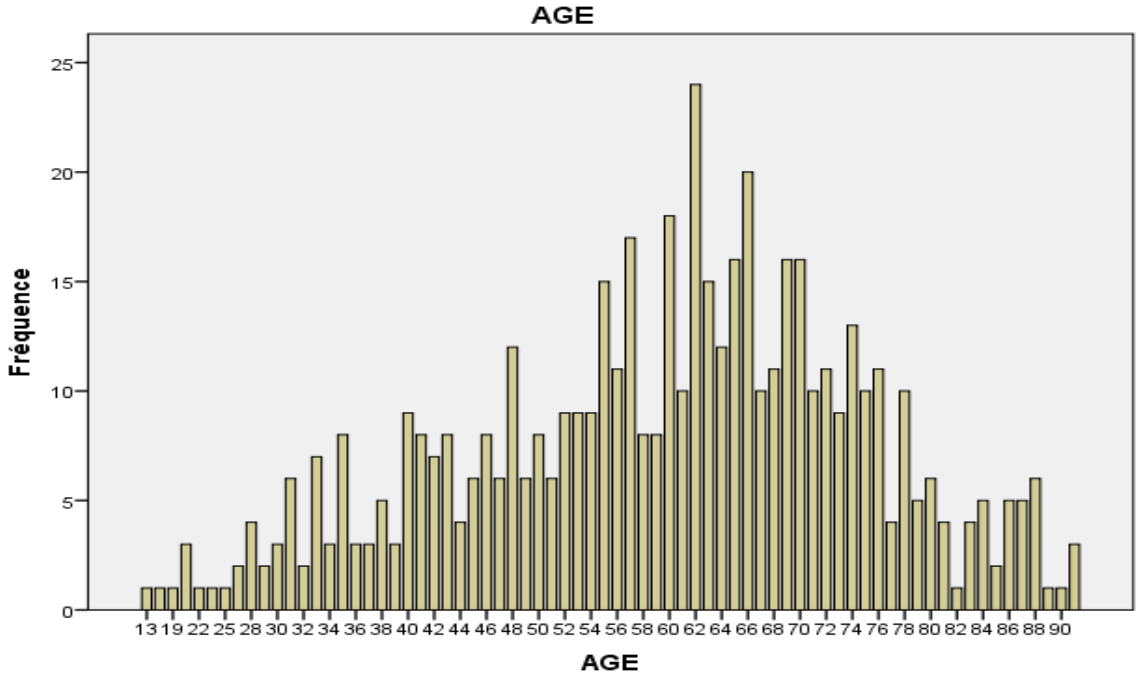

Figure 1: Age distribution of the study population.

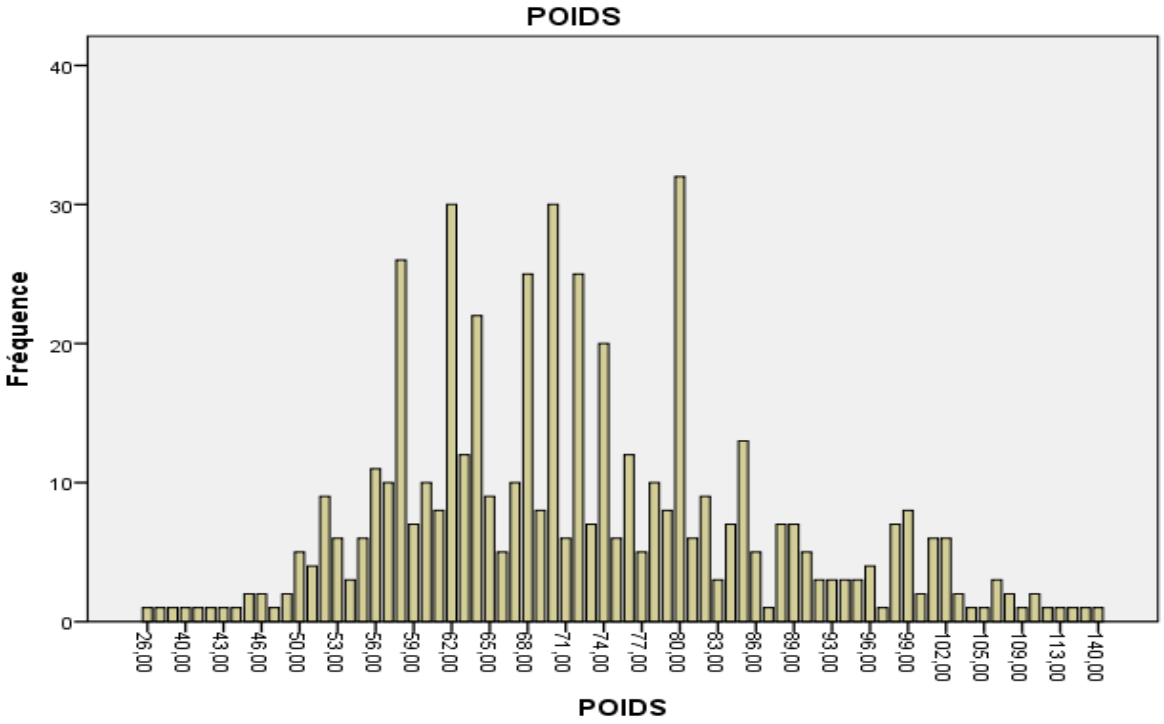

Figure 2: Weight distribution of the study population.

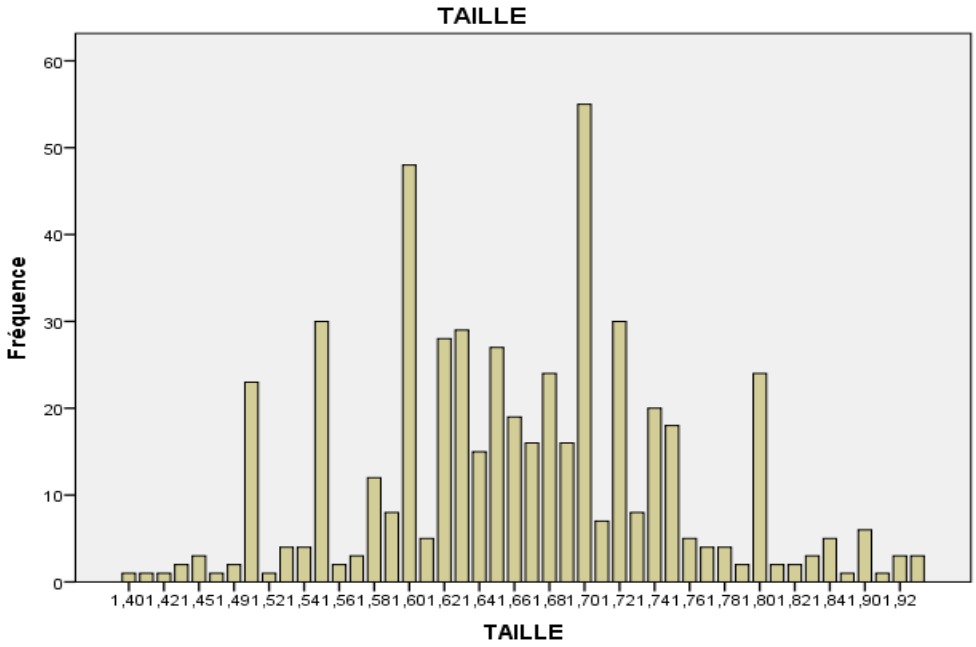

Figure 3: Weight distribution of the study population.

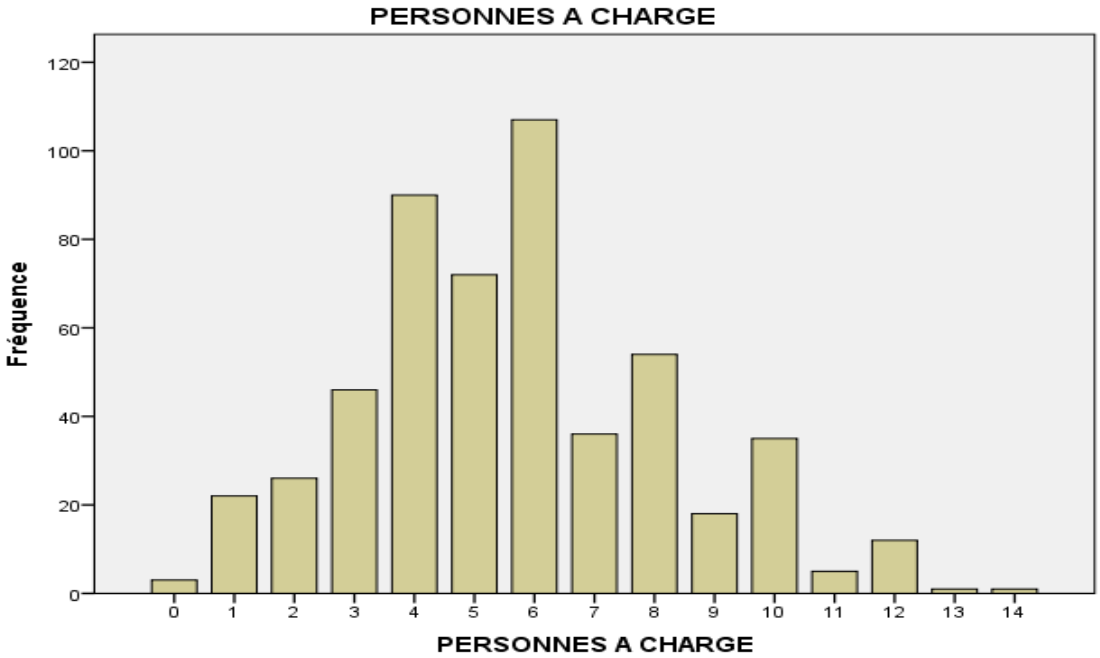

Figure 4: Distribution of the study population's number of people in charge.

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).

Clinical and metabolic factors		Frequency (n)	Percentage (%)	Cumulative Percentage (%)
Diabetic	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	
Hypercholesterolemia	No	433	82,0	82,0
	Yes	95	18,0	100,0
	Total	528	100,0	

Table 2: Distribution of clinical and metabolic factors in the study population. Note: Values are presented as frequencies and percentages of the study population (n = 528),

3.1.3. Socioeconomic factors

Socioeconomically, 84.8% of patients reported food insecurity, and 54.7% had a very low monthly income between 50,000 and 100,000 FCFA (Table 3).

Socioeconomic Factors		**Frequency (n)**	**Percentage (%)**	**Cumulative Percentage (%)**
Profession	Government employee	66	12,5	12,5
	Private sector employee	48	9,1	21,6
	Indépendant employee	44	8,3	29,9
	Farmer	101	19,1	49,1
	Breeder	9	1,7	50,8
	Retailler	55	10,4	61,2
	Pupil / Student	19	3,6	64,8
	Retired	95	18,0	82,8
	Housekeeper	79	15,0	97,8
	Unemployee	12	2,2	100,0
	Total	528	100,0	
Income Monthly	Less than 50 000F	75	14,2	14,2
	Between 50 et 100 000F	289	54,7	68,9
	Between 100 et 200 000F	129	24,4	93,4
	Between 200 et 300 000F	29	5,5	98,9
	More than 300 000F	6	1,1	100,0
	Total	528	100,0	
Food Safety	Insufficient	448	84,8	84,8
	Sufficient	80	15,2	100,0
	Total	528	100,0	

Note: Values are presented as frequencies and percentages of the study population (n = 528).

Table 3: Distribution of clinical and metabolic factors in the study population. Note: Values are presented as frequencies and percentages of the study population (n = 528),

3.1.4. Behavioral factors

Behaviorally, 5.7% were regular smokers, 33.7% regularly consumed alcohol, 26.1% practiced sports weekly, 22.3% consumed fruits and vegetables regularly,

Behavioral Factors		**Frequency (n)**	**Percentage (%)**	**Cumulative Percentage (%)**
Tabacco 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	
	No	125	23,7	23,7

Practising Sport	Former practitioner	62	11,7	35,4
	Occasionnal practitioner	203	38,4	73,9
	Regular practitioner	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	No Former consumer	0 8	0 1,5	0 1,5
	Occasional consumer	189	35,8	37,3
	Regular consumer	331	62,7	100,0
	Total	528	100,0	

Note: Values are presented as frequencies and percentages of the study population (n = 528).

Table 4: Distribution of behavioral factors in the study population,

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).

Environmental and Cultural Factors		Frequency (n)	Percentage (%)	Cumulative Percentage (%)
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	21	4,0	99,4
	Others	3	,6	100,0
	Total	528	100,0	
Cultural Area	Fang-Beti	429	81,3	81,6
	Soudan-Sahel	16	3,0	84,3
	GrassFields	60	11,4	95,6
	Sawa	8	1,5	97,2
	Others	15	2,8	100,0
	Total	528	100,0	

Note: Values are presented as frequencies and percentages of the study population (n = 528).

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

3.1.6. Heath factors

In terms of health system access, 83.1% lacked access to essential technologies, and 17.4% reported using traditional medicine. The most common hypertension-related complications were hypertensive heart disease (48.5%), ischemic heart disease (25.2%), heart failure (10.3%), and stroke (4.9%). Housekeepers aged around 60, with primary education, were the most affected by hypertension (Table 6).

Health factors		Frequency (n)	Percentage (%)	Cumulative Percentage (%)
HTA Complications	Hypertensive heart disease	255	48,3	48,3
	AVC	26	4,9	53,2
	Heart failiure	54	10,3	63,5
	Ischemic heart diseases	133	25,2	88,7
	Others	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	
Access to Medicine	No	36	6,8	6,8
	Yes	492	93,2	100,0
	Total	528	100,0	
Acces to Therapeutic Education	No	53	10,0	10,0
	Yes	475	90,0	100,0
	Total	528	100,0	
Recours to Traditionnal Medicine	No	436	82,6	82,6
	Yes	92	17,4	100,0
	Total	528	100,0	

Note: Values are presented as frequencies and percentages of the study population (n = 528).

Table 6: Distribution of health factors in the study population.,

Overall, hypertension is present in 78.8% of participants. 84.8% of these participants live in unfavorable socioeconomic conditions in urban areas (75.8%), and 62.3% regularly consume salty or sugary foods. 78.6% of diseases are detected late and 17.4% recourse to traditional care.

3.2. Bivariate Analysis

3.2.1. Sociodemographic factors

Sociodemographically, age was strongly associated with the onset of hypertension, while marital status, level of education, and gender were weakly associated with hypertension among the study population (Figure 5).

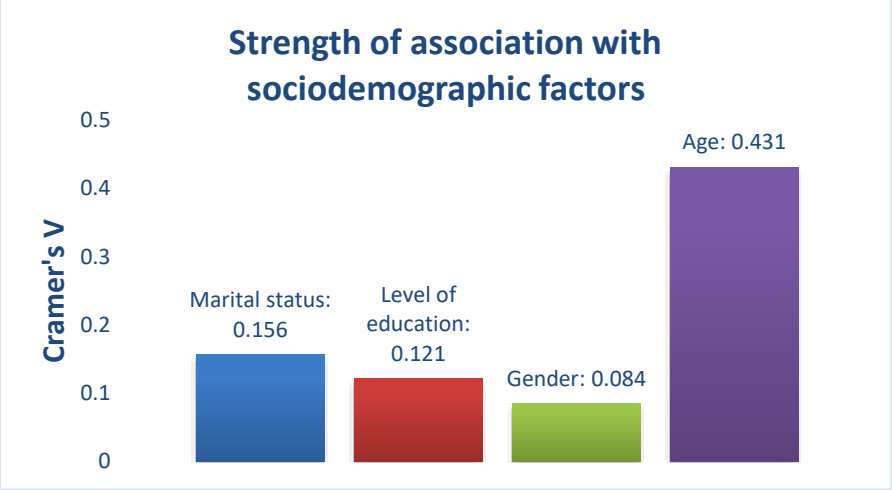

Figure 5: Strength of association between hypertension and sociodemographic factors (A value of Cramer's V between 0 and 0.1 indicates a weak association; between 0.1 to 0.3 a moderate association, and above 0.3 a strong association).

3.2.2. Clinical and metabolic factors

In clinical and metabolic terms, there was a weak association between hypertension, diabetes, and hypercholesterolemia, respectively among the study population (Figure 6).

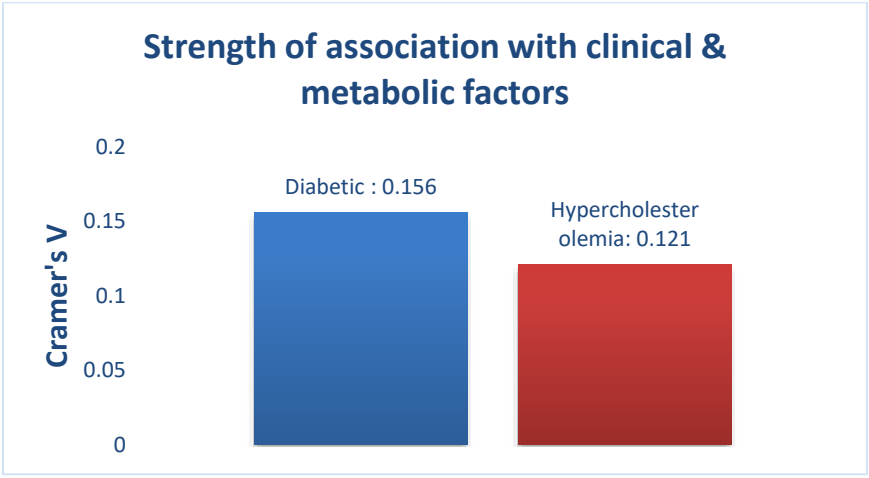

Figure 6: Strength of association between hypertension and clinical & metabolic factors (A value of Cramer's V between 0 and 0.1 indicates a weak association; between 0.1 to 0.3 a moderate association, and above 0.3 a strong association).

3.2.3. Socioeconomic factors

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

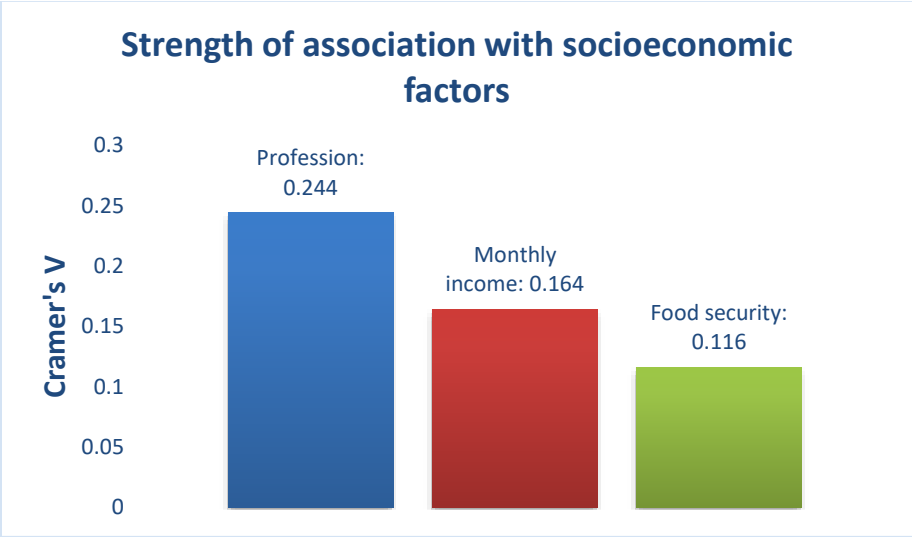

Figure 7: Strength of association between hypertension and socioeconomic factors (A value of Cramer's V between 0 and 0.1 indicates a weak association; between 0.1 to 0.3 a moderate association, and above 0.3 a strong association).

3.2.4. Behavioral factors

At the behavioral level, 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 study population (Figure 8).

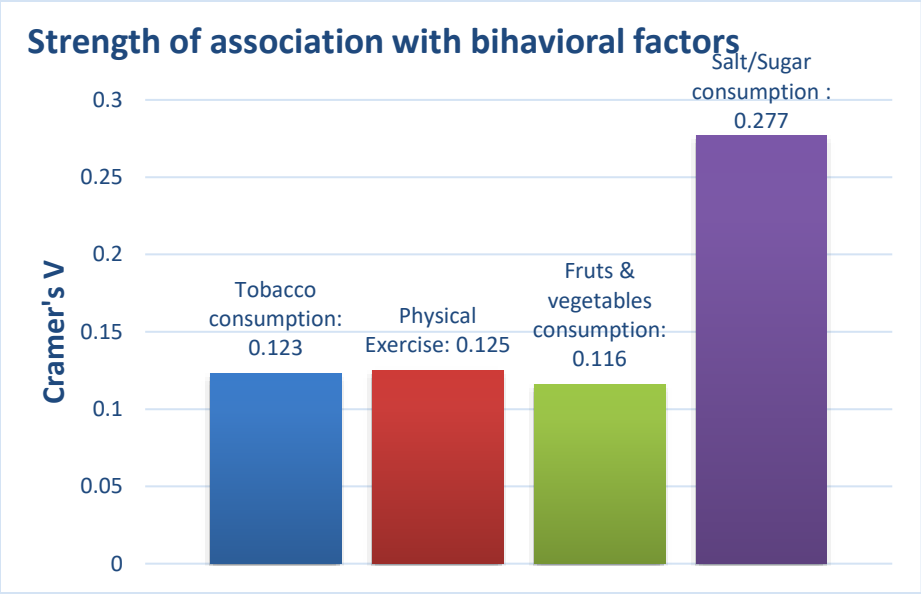

Figure 8: Strength of association between hypertension and socioeconomic factors (A value of Cramer's V between 0 and 0.1 indicates a weak association; between 0.1 to 0.3 a moderate association, and above 0.3 a strong association).

3.2.5. Environmental and cultural factors

Regarding the physical and socio-cultural environment, there was no association between hypertension and independent variables tested among the study population.

3.2.6. Health factors

Regarding health, 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).

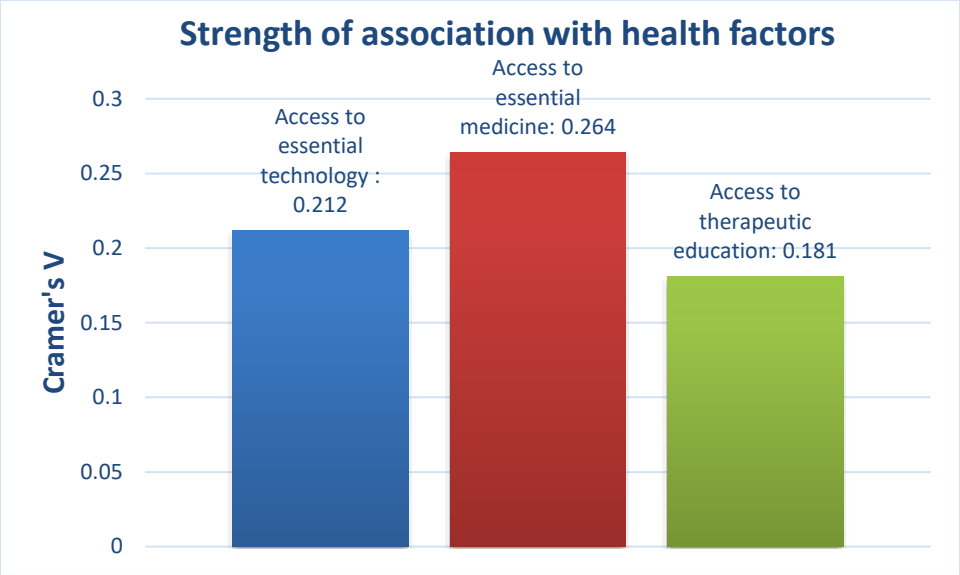

Figure 9: Strength of the association of hypertension with the health environment (A value of Cramer's V between 0 and 0.1 indicates a weak association; between 0.1 to 0.3 a moderate association, and above 0.3 a strong association).

Finally, bivariate analysis revealed moderate associations between hypertension and variables such as age, occupation, salt/sugar intake, and access to health technologies. Weaker associations were observed with factors like education level, marital status, income, hypercholesterolemia, and smoking.

3.3. Multivariate Analysis

A binary logistic regression was performed to identify factors independently associated with known hypertension. The full model was significant, χ^2 (26, N = 528) = 352.51, $p < 0.001$, with a Cox and Snell R^2 of 42.6% and a Nagelkerke R^2 of 66.1%. This level is considered high in social sciences. The model correctly classified 89.6% of individuals as known or unknown hypertensive, which attests to the overall high quality of the model.

The following variables were independently associated with hypertension ($p < 0.05$) as risk factors: age (OR=1.028), marital status (OR=3.859), education level (OR=15.494), hypercholesterolemia (OR=2.856), number of dependents (OR=1.231), food insecurity (OR=16.666), tobacco use (OR=8.592), salt/sugar consumption (OR=8.129), low fruit and vegetable intake (OR=0.027), urban residence (OR=4.794), access to essential technologies (OR=8.851), and use of traditional medicine (OR=3.137). Higher monthly income (OR=0.882) and higher fruit and vegetables consumption (0.976) was found to be protective (Table 7).

Factors	Variable	Adjusted OR	95% CI	p-value
Independent risk factors (Adjusted OR > 1 and p < 0.05)	Age	1.028	[1.010–1.047]	0.002**
	Low education level	15.494	[1.791–34.090]	0.013*
	Marital status (Married)	3.859	[1.059–14.064]	0.040*
	Hypercholesterolemia	2.856	[1.048–7.783]	0.040*
	High number of dependents	1.231	[1.030–1.471]	0.022*
	Food insecurity	16.666	[3.720–74.640]	< 0.001***
	Regular tobacco use	8.592	[1.379–53.523]	0.021*
	Regular salt/sugar intake	8.129	[2.412–27.411]	0.001**
	Urban residence	4.794	[1.462–15.720]	0.009**
	Poor access to health technology	8.851	[2.054–38.148]	0.003**
	Traditional medicine use	3.137	[1.043–9.436]	0.042*
Independent protective factors (Adjusted OR < 1 and p < 0.05)	Regular fruit/vegetable intake	0.027	[0.003–0.228]	0.001**
	Higher monthly income	0.882	[0.793–0.981]	0.021*

Note: Only significant variables ($p < 0.05$) are presented for clarity. OR = Odds Ratio; CI = Confidence Interval; $p < 0.05$ considered statistically significant (with *p< 0.05; **p< 0.01; ***p< 0.001).

Table 7: Multivariate logistic regression analysis of factors associated with hypertension.

The final binary logistic regression model predicting the probability p that an individual is hypertensive is:

logit (p) = − 5.333 + 0.028 x age + 2.740 x level education + 1.351 x marital status + 1.049 x level cholesterol + 0.208 x number dependents + 2.812 x food security + 2.150 x smoking + 2.096 x salt/sugar intake

+ 1.568 x residence + 2.181 x access health technologies + 1.144 x traditional medicine use − 3.612 x fruit/vegetable consumption − 0.126 x monthly income

Where:

- logit(p) = ln (p / (1 - p)) ;
- p = probability of being hypertensive;
- Binary variables are coded; 1 = presence of the characteristic, 0 = absence;
- The β coefficients correspond to the natural logarithm of the adjusted ORs calculated in the multivariate model.

This equation makes it possible to calculate, for a given individual, the probability of known hypertension based on their sociodemographic, clinical, and behavioral characteristics.

4. Discussion

This study revealed a very high prevalence of hypertension (78.8%) among patients treated at the Cardiology Department of the SRH (representing 16,13% of total outpatients and 8,96% of overall hospitalizations [17]). Nearly half of hypertensive patients experienced hypertensive heart disease complications. These findings underscore the growing burden of hypertension in low-resource settings, particularly in sub-Saharan Africa, where early detection and management remain limited [5-8]. Unfortunately, these figures are rising with urbanization, the westernization of diets, and the aging of the population.

Age was significantly associated with hypertension. 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%). These results are consistent with well-documented evidence linking older age to vascular stiffening and cumulative exposure to cardiovascular risk factors [18]. As in other African settings, we found that individuals with limited formal education were more likely to be hypertensive, possibly due to lower health literacy, reduced access to information, and delayed care-seeking behaviours [19]. The increase of hypertension observed among housekeepers (adjusted OR = 15.494) compared to other occupations seems to be linked to their low level of literacy. Concerning marital status, 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 [20]. Despite these results, we found that being married or in a union appeared to increase the risk of hypertension by 3.9 times, possibly reflecting stress from familial and economic responsibilities in a context of widespread poverty.

Clinically, hypercholesterolemia was a strong predictor of hypertension. Indeed, hypercholesterolemia increases the risk of hypertension by approximately 2.9 times supporting the known interplay between lipid metabolism disorders and cardiovascular dysfunction. The high rate of coexisting obesity and diabetes further highlights the clustering of non-communicable disease risk factors in this population, which reinforces the need for integrated care approaches [8,9,16].

Socioeconomic vulnerability emerged as a major driver of hypertension. Patients with low income, high household dependency ratios, and food insecurity were significantly more likely to be hypertensive. Indeed, each additional dependent increases the likelihood of having known hypertension by 23.1%. In addition, people who are unable to meet their nutritional needs are 16.7 times more likely to have known hypertension. The occupation and the number of dependents in a household therefore, act synergistically on food security, which in turn influences the occurrence of hypertension with an odds ratio of 16.666. This association is directly proportional to the number of dependent children (adjusted OR = 1.231). This may reflect increased stress due to more dependants and limited access to regular medical monitoring. These findings are consistent with the literature showing that poverty limits access to healthy food, preventive services, and regular follow-up, while increasing psychological stress [12-14,21,22].

Behavioural factors such as excessive salt/sugar intake and tobacco use were also independently associated with hypertension, in line with global evidence [6]. People with a low level of education are 15.5 times more likely to have high blood pressure. Indeed, most behavioural factors are related to the level of health education. A higher level of education reflects a better understanding of their health status. Conversely, regular fruit and vegetable consumption was found to be protective, supporting dietary recommendations for cardiovascular health [16,23]. Regular consumption of fruits and vegetables is associated with a 97.3% reduction in the likelihood of hypertension. 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. In our study context unfortunately, regular consumption of fruits and vegetables is synonymous with poverty and therefore an obstacle to the prevention of hypertension.

Beyond individual factors, structural barriers were evident. Most patients lacked access to essential medicines and health technologies such as blood pressure monitors or glucometers, and many reported using traditional medicine as a substitute for biomedical care. Access to better healthcare technologies may reflect greater awareness or better diagnosis, but the poverty of the population often complicates this situation. In this study, the recourse to traditional care is estimated at 17.4% which often lead to undiagnosed hypertension. These findings highlight gaps in the health system, particularly in rural and semi-urban areas [12,15] and call for investment in primary healthcare, accessible diagnostics, and culturally sensitive health education.

The integration of multivariate results confirmed the combined influence of sociodemographic, clinical, behavioural, and structural factors on hypertension. The predominant role of food insecurity and low educational attainment underscores the importance of social determinants of health. The strong association with smoking, excessive salt/sugar intake, and limited access to health technologies illustrates the weight of risky behaviours and structural barriers. The protective effects of fruit/vegetable consumption and higher income reinforce nutritional recommendations and the importance of improving socioeconomic conditions to prevent hypertension.

The study limitations its retrospective design that might have introduced missing data or information bias, especially in behavioural variables collected via telephone interviews. Furthermore, as the sample was drawn from a hospital population, findings may not fully represent the general population of southern Cameroon. However, the use of both medical records and patient follow-up interviews strengthens the internal validity of the findings.

Conclusion

Hypertension is highly prevalent (78.8%) and frequently complicated among patients at the SRH (hypertensive heart disease (48.5%),

ischaemic heart disease (25.2%), heart failure (10.3%) and stroke (4.9%). These results show that hypertension in the study population is multifactorial, associated with sociodemographic determinants (age, education level, marital status, number of dependents, place of residence), behavioural determinants (smoking, salt/sugar consumption, diet), and determinants related to access to healthcare (health technologies, use of traditional medicine).

This study provides evidence from southern Cameroon, identifying key risk factors such as food insecurity, low educational attainment, and poor access to health technologies in a semi-urban population. It highlights the burden of hypertension-related complications and the role of traditional medicine and health system limitations in disease management. These findings underscore the urgent need for integrated, community-based prevention strategies targeting behavioural risk factors and social determinants of health. Strengthening health literacy, improving access to affordable diagnostic tools, and addressing food insecurity should be prioritized to reduce the burden of hypertension in southern Cameroon and similar settings.

Future research should explore longitudinal and community-level data to better inform public health policies and tailored interventions.

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