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Original Article

Factors Associated with Hypertension Among Adult Outpatients Attending Two Selected Hospitals in Rwanda

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Background: Hypertension affects more than one billion people worldwide, accounting for nearly 10 million deaths and approximately 220 million Disability-Adjusted Life Years (DALYs) in 2017. Despite its growing burden, evidence on the prevalence and associated factors of hypertension remains limited in many African countries, including Rwanda, and is not fully integrated into national health policies. This study aimed to identify factors associated with hypertension among adult patients attending selected hospitals in Rwanda.

Methods: A cross-sectional study was conducted among adults aged 18–64 years attending Gisenyi District Hospital in the Western Province and Rwamagana Provincial Hospital in the Eastern Province of Rwanda. Using stratified proportionate sampling, 313 participants were recruited between August and September 2025. Data were collected using a structured questionnaire. Descriptive statistics were summarized using frequencies and percentages, while chi-square tests and multivariate logistic regression were used to identify factors associated with hypertension. Statistical significance was set at $p < 0.05$ with 95% confidence intervals. Ethical approval was obtained, and informed consent was secured from all participants.

Results: The prevalence of hypertension was 40.3%. Factors significantly associated with hypertension included older age, daily smoking, daily alcohol consumption, frequent addition of salt to food, physical inactivity, obesity (BMI ≥30.0 kg/m²), and a family history of hypertension. Adults aged ≥60 years were nearly seven times more likely to be hypertensive compared to younger adults (AOR = 6.786, 95% CI: 2.492–18.479, $p = 0.002$).

Conclusion: Hypertension is a major public health concern among adult outpatients in the selected Rwandan hospitals. Routine blood pressure screening, health education focusing on smoking cessation, alcohol moderation, reduced salt intake, increased physical activity, weight management, and family-centered counseling are recommended. These findings provide important evidence to inform policy and strengthen hypertension prevention and control strategies in Rwanda.

Key words: Prevalence, Factors, Hypertension, Adult Outpatients, Rwanda

Introduction

Hypertension is a major global public health challenge and a leading contributor to morbidity and mortality. It affects more than one billion people worldwide, with approximately 25% of men and 20% of women living with the condition. In 2017 alone, hypertension accounted for an estimated 10.5 million deaths and 219 million DALYs (van de Vijver, 2021). As one of the most prominent non-communicable diseases (NCDs), hypertension significantly increases the risk of cardiovascular, renal, and cerebrovascular complications, making it a critical global health concern (Solomon, 2023). Low- and middle-income countries (LMICs) bear a disproportionate share of the global hypertension burden, accounting for about 75% of cases. Rapid urbanization, adoption of sedentary lifestyles, and increased exposure to behavioral risk factors have contributed to the growing prevalence of hypertension in these settings (WHO, 2023). Global estimates show that 1.39 billion adults, approximately one in four, are affected, and prevalence is expected to rise further as LMICs undergo demographic and lifestyle transitions (Omar et al., 2020). Hypertension rates vary across regions and income levels, indicating differences in risk profiles and health system responses.

In Africa, the prevalence of hypertension is among the highest globally, averaging 30%, compared to 18% in the Americas (Nahimana et al., 2018). Prevalence estimates also differ across specific countries: 29.6% in China and 49.6% in the United States (Chobufo, 2020; Wang, 2023), 30.6% in metropolitan France, and 38.4% in Mayotte (Calas et al., 2022). Within Africa, prevalence has increased dramatically over recent decades, with projections suggesting a rise to more than 216 million cases by 2030 (Adeloye & Basquill, 2014). Some regions, such as Northern Africa, report higher rates (33.3%) compared to Sub-Saharan Africa (27%) (Adeloye & Basquill, 2014). Country-level studies further reveal significant variation: 7.3%–26.4% in the DRC depending on diagnostic criteria (Wanghi et al., 2019), 26.2% in Uganda (Alinaitwe, 2024), 28.6% in Kenya (Pengpid & Peltzer, 2020), 16.7% in Burundi, and 29.3% in Tanzania (Iradukunda et al., 2021). These findings underscore a considerable and growing burden of hypertension across the continent.

Rwanda is also experiencing an epidemiological shift, with NCDs such as hypertension rising alongside infectious diseases (Rwanda MOH, 2014). National estimates indicate a hypertension prevalence of approximately 15% among adults aged 15–64, with slightly higher rates among males (16.5%) than females (14.4%), and higher prevalence in the Western Province compared to the Eastern Province (Nahimana et al., 2018).

Despite this growing burden, significant gaps remain in understanding hypertension among adults seeking care in Rwandan hospitals. Existing studies have predominantly focused on community-based populations, leaving limited evidence on risk factors among outpatient populations aged 18–64 years. This gap is particularly important

because hospital-based data provide insights into clinical severity, comorbidities, and health-seeking behaviors information that community surveys may not capture.

This study aims to address this gap by examining hypertension and its associated factors among adults attending two hospitals: Gisenyi District Hospital in the Western Province and Rwamagana Provincial Hospital in the Eastern Province. Comparing these settings allows exploration of potential regional differences related to lifestyle, socioeconomic status, and healthcare access. The findings will contribute meaningful evidence to guide clinicians, public health practitioners, and policymakers in developing targeted interventions for hypertension prevention and management in Rwanda.

Materials and Methods

Research Design

This analytical study employed a cross-sectional design using a quantitative approach. The design was appropriate for estimating the prevalence of hypertension and identifying associated factors among adults aged 18–64 years attending the outpatient departments of Gisenyi District Hospital and Rwamagana Provincial Hospital. Data were collected at a single point in time, allowing examination of associations between hypertension and potential determinants.

Study Population

The study population consisted of adult patients aged 18–64 years attending the outpatient departments (OPD) of Gisenyi District Hospital (Western Province) and Rwamagana Provincial Hospital (Eastern Province) during the study period.

Sample Size Determination

A sample size of 313 participants was calculated using Cochran's formula, appropriate for prevalence studies. The formula incorporated:

- Z = 1.96, corresponding to a 95% confidence level
- p = 0.20, based on the estimated hypertension prevalence of 18.6% in Rwanda (Nahimana et al., 2018)
- E = 0.05, representing a 5% margin of error

This ensured adequate precision for estimating hypertension prevalence.

Sampling Procedure

A stratified proportionate random sampling method was used.

Sampling Frame

The sampling frame consisted of:

1. All adult outpatients (18–64 years) attending Gisenyi District Hospital OPD

2. All adult outpatients (18–64 years) attending Rwamagana Provincial Hospital OPD

Each hospital represented one stratum.

Sampling Steps

1. Proportionate allocation:

The total sample (N = 313) was divided between the two hospitals based on their average daily OPD attendance.

2. Systematic random sampling within each hospital:

- A sampling interval (k) was computed for each hospital based on expected daily OPD flow.
- Every kth eligible patient was recruited until the hospital's allocated sample size was reached.

This ensured each outpatient had an equal chance of selection.

This simplified approach avoided unnecessary clustering or overly complex subgrouping.

Research Instruments

Data were collected using a pre-tested interviewer-administered questionnaire adapted from the WHO STEPS tool (Riley et al., 2016; WHO, 2021). The instrument included four sections:

1. Sociodemographic characteristics: age, sex, occupation, education, residence, health insurance, wealth index, weight, and height
2. Clinical and anthropometric measures: blood pressure, BMI, medical history
3. Behavioral factors: tobacco use, alcohol consumption, diet (including salt intake), physical activity
4. Comorbidities: diabetes, HIV, hepatitis B/C, and obesity

The questionnaire was translated into Kinyarwanda for ease of administration.

Reliability Testing

Reliability refers to the consistency of an instrument.

- Internal consistency of the questionnaire was assessed using Cronbach's alpha, yielding a value of 0.90, indicating excellent reliability (acceptable threshold ≥ 0.70).
- A pilot test involving 10% of the sample size was conducted at a similar facility to ensure clarity and consistency of items.

Validity Testing

Validity ensures that the instrument measures what it is intended to measure.

- Content validity was established through expert review and adaptation from a widely validated tool (WHO STEPS).
- The pilot study also helped assess face validity and identify ambiguous or unclear items for refinement.

Data Analysis Procedures

Data were entered into SPSS version 21 for analysis.

1. Descriptive statistics:

Means, frequencies, and percentages were used to summarize participant characteristics.

2. Hypertension classification:

Hypertension was defined as blood pressure ≥130/80 mmHg, confirmed after three consecutive measurements. Readings of 120–129/<80 mmHg were classified as elevated but not hypertensive.

3. Bivariate analysis:

Chi-square tests were used to examine associations between hypertension and independent variables.

Variables with $p < 0.05$ were considered statistically significant.

4. Selection of variables for multivariate analysis:

All variables with $p < 0.20$ in bivariate analysis were included in the multivariate logistic regression model to avoid excluding potentially important predictors—a commonly recommended approach.

5. Multivariate analysis:

Binary logistic regression was used to identify independent predictors of hypertension while adjusting for confounders.

Statistical significance was set at $p < 0.05$ with 95% confidence intervals.

Ethical Considerations

Ethical approval was obtained from the Mount Kenya University Institutional Ethics Committee and the IRBs of both participating hospitals. Participation was voluntary, and informed consent was obtained from all respondents. Confidentiality was ensured through anonymous data collection and password-protected file storage. The principles of beneficence, justice, and respect for persons were strictly observed.

Results

Table 1. Socio-demographic Characteristics of the Respondents, n=313

Variables	Frequency	Percentage
Gender		
Female	155	49.6
Male	158	50.4
Age		
18–39	182	58.1
40–59	110	35.1
>=60	21	6.7
Marital status		
Single	100	31.9
Married	193	61.7

Divorced/Widow	20	6.4
Education level		
No formal education	54	17.3
Primary	92	29.4
Secondary	112	35.8
University	55	17.6
Occupation		
Employed	122	39.0
Unemployed	191	61.0
Place of residence		
Urban	192	61.3
Rural	121	38.7
Wealth index		
Low level	12	3.8
Middle level	96	30.7
High level	205	65.5

Source: Primary data, 2025

The study included 313 adult outpatients, with a nearly equal distribution of gender showing 50.4% of male with 49.6% of female. Age distribution showed that the majority were young adults (18–39 years, 58.1%), followed by middle-aged adults in the group of 40–59 (35.1%) and elders (≥60, 6.7%). Regarding marital status, most participants were married (61.7%), 31.9% were single, and 6.4% were divorced or widowed. In terms of education level, 35.8% had completed secondary education, 29.4% primary education, 17.6% university education, and 17.3% had no formal education. For occupation, 61.0% were unemployed and 39.0% employed. Most participants resided in urban areas (61.3%), with 38.7% living in rural settings. Based on the wealth index, 65.5% of participants were in the high-level category, 30.7% in the middle level, and 3.8% in the low-level category.

Table 2. Prevalence of hypertension in patients attending the OPD in Gisenyi District Hospital and Rwamagana Provincial Hospital, n=313

Non hypertension – Systolic <129 mmHg and Diastolic <80 mmHg	Hypertension – Systolic >=130 mmHg or Diastolic >=80 mmHg	Total
Gisenyi District Hospital		
130(58.8)	91(41.2)	221
Rwamagana Provincial Hospital		
57(62.0)	35(38.0)	92
Total		
187(59.7)	126(40.3)	313

Source: Primary data, 2025

Table 2 presents the prevalence of hypertension in patients seeking care to the outpatient departments (OPD) of Gisenyi District Hospital and Rwamagana Provincial Hospital. Out of the total 313 participants assessed, 59.7% were classified as non-hypertensive, with systolic blood pressure below 129 mmHg and diastolic pressure below 80 mmHg, while 40.3% were identified as hypertensive, presenting systolic blood pressure equal to or greater than 130 mmHg or diastolic pressure equal to or greater than 80 mmHg.

At Gisenyi District Hospital, 58.8% of the respondents were found to be non-hypertensive, whereas 41.2% were hypertensive. Similarly, at Rwamagana Provincial Hospital, 62.0% of the respondents had normal blood pressure, while 38.0% were hypertensive. These findings indicate that hypertension was relatively common among adult outpatients in both hospitals, with a slightly higher prevalence observed at Gisenyi District Hospital compared to Rwamagana Provincial Hospital. The overall prevalence is presented in Figure 1 below.

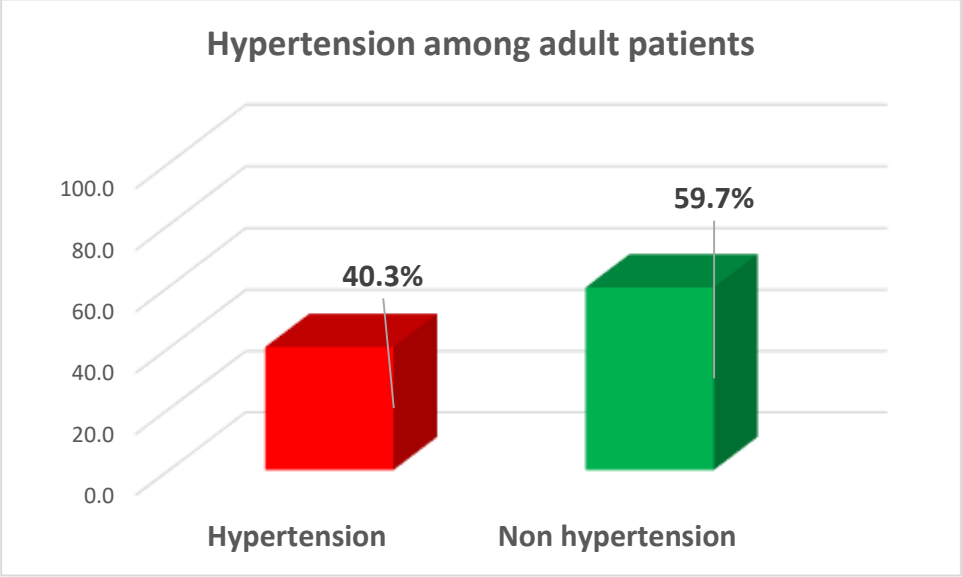

Figure 1. Prevalence of hypertension in patients attending the OPD in Gisenyi District Hospital and Rwamagana Provincial Hospital

The results illustrated in Figure 1 show the prevalence of hypertension in patients seeking care to the OPD at Gisenyi District Hospital and Rwamagana Provincial Hospital, indicating that 40.3% of participants were hypertensive, whereas 59.7% were not.

Table 3. Bivariate analysis of Socio-demographic factors associated with hypertension among adult patients attending the OPD in Gisenyi District Hospital and Rwamagana Provincial Hospital

Particulars	Hypertension	Chi-square	P-value

	No n(%)	**Yes n(%)**		
Gender			0.360	0.548
Male	97(61.4)	61(38.6)		
Female	90(58.1)	65(41.9)		
Age			33.804	**0.001**
18–39	133(73.1)	49(26.9)		
40–59	48(43.6)	62(56.4)		
>=60 years	6(28.6)	15(71.4)		
Marital status			21.508	**0.001**
Single	78(78.0)	22(22.0)		
Married	101(52.3)	92(47.7)		
Divorced/Widow	8(40.0)	12(60.0)		
Education level			6.492	0.090
No formal education	25(46.3)	29(53.7)		
Primary	53(57.6)	39(42.4)		
Secondary	72(64.3)	40(35.7)		
University	37(67.3)	18(32.7)		
Occupation			0.466	0.495
Employed	70(57.4)	52(42.6)		
Unemployed	117(61.3)	74(38.7)		
Place of residence			0.028	0.867
Urban	114(59.4)	78(40.6)		
Rural	73(60.3)	48(39.7)		
Wealth index			2.607	0.272
Category 1	8(66.7)	4(33.3)		
Category 2	51(53.1)	45(46.9)		
Category 3 et 4	128(62.4)	77(37.6)		
Total=313				

Source: Primary data, 2025

The analysis revealed that age was notably linked to hypertension (χ^2 = 33.804, p = 0.001). Hypertension prevalence increased with age: 26.9% between young adults aged 18–39 years, 56.4% between middle-aged adults aged 40–59 years, and 71.4% between older adults aged ≥60 years.

Marital status was also significantly related to hypertension (χ^2 = 21.508, p = 0.001). Married participants had a prevalence of 47.7%, while divorced or widowed participants exhibited the highest prevalence at 60.0%. Single individuals had the lowest prevalence (22.0%).

In contrast, education level, gender, occupation, wealth index and place of residence showed no associations amid hypertension in this study.

Table 4. Bivariate analysis of behavioral factors associated with hypertension among adult patients attending the OPD in Gisenyi District Hospital and Rwamagana Provincial Hospital

Particulars	Hypertension		Chi-square	P-value
	No n(%)	Yes n(%)		
Are you currently using tobacco products for smoking?			0.015	0.903
Yes	11(61.1)	7(38.9)		
No	176(59.7)	119(40.3)		
Are you currently a daily smoker of tobacco products?			7.167	**0.007**
Yes	4(26.7)	11(73.3)		
No	183(61.4)	115(38.6)		
What was your age when you started smoking every day? (in years)			0.186	0.911
20 years or less	6(66.7)	3(33.3)		
More than 20 years	6(60.0)	4(40.0)		
N/A	175(59.5)	119(40.5)		
Have you ever drunk alcohol such as wine, beer, or locally brewed fermented beer?			0.313	0.576
Yes	86(58.1)	62(41.9)		
No	101(61.2)	64(38.8)		
At which frequency do you consume alcohol?			8.079	**0.044**
Daily	4(26.7)	11(73.3)		
Weekly	32(56.1)	25(43.9)		
Occasionally	49(61.2)	31(38.8)		
None of the above	102(63.4)	59(36.6)		
At which frequency do you eat fruit?			35.502	**0.001**
Always	55(93.2)	4(6.8)		
Sometimes	72(48.6)	76(51.4)		
Occasionally	60(56.6)	46(43.4)		
At which frequency are you eating vegetables?			11.281	**0.004**
Always	84(71.8)	33(28.2)		
Sometimes	83(52.5)	75(47.5)		
Occasionally	20(52.6)	18(47.4)		
At which frequency of eating added salt?			17.189	**0.001**
Always	1(8.3)	11(91.7)		
Sometimes	64(57.1)	48(42.9)		
Occasionally	47(71.2)	19(28.8)		

Never	75(61.0)	48(39.0)		
What is your estimation of your intake of salt?			2.176	0.537
Far too little	56(65.1)	30(34.9)		
Too little	63(57.8)	46(42.2)		
Average	67(57.3)	50(42.7)		
Too much	1(100.0)	0(0.0)		
Which kind of fat or oil is most frequently used in your home to prepare meals?			0.546	0.761
Butter oil	31(55.4)	25(44.6)		
Vegetable oil	105(60.7)	68(39.3)		
Other	51(60.7)	33(39.3)		
Do you do physical activity?			29.929	**0.001**
Yes	135(72.2)	52(27.8)		
No	52(41.3)	74(58.7)		
At which frequency are you doing physical activity?			21.460	**0.001**
Every day	24(96.0)	1(4.0)		
Three days per week	14(82.4)	3(17.6)		
Two days per week	29(52.7)	26(47.3)		
More than three days per week	2(50.0)	2(50.0)		
Every weekend	56(60.2)	37(39.8)		
Never	62(52.1)	57(47.9)		
Total=313				

Source: Primary data, 2025

The analysis revealed that daily smoking of tobacco products was significantly associated with hypertension, with 73.3% of daily smokers being hypertensive compared to 38.6% of non-daily smokers ($\chi^2 = 7.167$, $p = 0.007$). Alcohol consumption frequency also showed a significant association ($\chi^2 = 8.079$, $p = 0.044$). The highest prevalence was observed in daily drinkers (73.3%), followed by weekly consumers (43.9%), while those who drank occasionally (38.8%) or not at all (36.6%) had lower rates.

Dietary habits were important predictors. The consumption of fruit was significantly associated with hypertension ($\chi^2 = 35.502$, $p = 0.002$). Only 6.8% of participants who always ate fruits were hypertensive, compared to 51.4% of those who sometimes ate fruits and 43.4% of those who ate them occasionally. Similarly, vegetable consumption was significantly related to hypertension ($\chi^2 = 11.281$, $p = 0.004$). The prevalence was lowest in those who always ate vegetables (28.2%) compared to those who sometimes (47.5%) or occasionally (47.4%) consumed them.

The use of added salt was linked to hypertension too ($\chi^2 = 17.189$, $p = 0.001$). Almost all participants who always added salt to their meals were hypertensive (91.7%), compared to 42.9% among those who sometimes added salt, 28.8% among those who occasionally added it, and 39.0% among those who never did.

Physical activity emerged as another strong determinant ($\chi^2 = 29.929$, $p = 0.001$). The prevalence was higher in participants who reported no physical activity (58.7%) compared to those who were physically active (27.8%). Moreover, the frequency of physical activity mattered ($\chi^2 = 21.460$, $p = 0.001$): only 4.0% of participants exercising daily were hypertensive, compared to 17.6% of those exercising three times per week, 47.3% of those exercising twice per week, and 47.9% among those who never exercised.

In contrast, other behavioral factors such as history of alcohol consumption, perception of salt intake, and type of cooking oil used in the household showed no associations amid hypertension in this study.

Table 5. Bivariate analysis of clinical factors and comorbidities associated with hypertension in patients attending the OPD in Gisenyi District Hospital and Rwamagana Provincial Hospital

Particulars	Hypertension		Chi-square	P-value
	No n(%)	Yes n(%)		
Has a medical professional ever informed you that you have hypertension or raised blood pressure?			34.787	**0.001**
Yes	4(12.1)	29(87.9)		
No	183(65.4)	97(34.6)		
Are you currently taking any blood pressure medication?			21.618	**0.001**
Yes	4(16.0)	21(84.0)		
No	183(63.5)	105(36.5)		
Does anyone in your family have hypertension?			14.347	**0.001**
Yes	34(42.0)	47(58.0)		
No	153(65.9)	79(34.1)		
Has a medical professional ever informed you that you have diabetes or raised blood sugar?			1.794	0.180
Yes	7(43.8)	9(56.2)		
No	180(60.6)	117(39.4)		
Are you currently taking any diabetes medication?			1.120	0.290
Yes	7(46.7)	8(53.3)		
No	180(60.4)	118(39.6)		

Have you been diagnosed with HIV?			0.448	0.503
Yes	14(66.7)	7(33.3)		
No	173(59.2)	119(40.8)		
Have you tested positive for HVC?			0.996	0.318
Yes	16(69.6)	7(30.4)		
No	171(59.0)	119(41.0)		
Have you tested positive for HVB?			3.800	0.051
Yes	3(30.0)	7(70.0)		
No	184(60.7)	119(39.3)		
Have you tested positive for CKD?			7.619	**0.006**
Yes	1(12.5)	7(87.5)		
No	186(61.0)	119(39.0)		
Total =313				

Source: Primary data, 2025

The analysis revealed that participants who had in the past been informed by a medical staff that they had raised blood pressure were much more likely to be hypertensive, with 87.9% in this group affected compared to 34.6% among those never diagnosed ($\chi^2 = 34.787$, $p = 0.001$). Similarly, patients who were currently taking blood pressure medication had a markedly higher prevalence of hypertension (84.0%) compared to those not on medication (36.5%) ($\chi^2 = 21.618$, $p = 0.001$). Hypertension in the family was also a strong predictor, with 58.0% of those reporting a hypertensive relative being hypertensive themselves versus 34.1% among those without such a history ($\chi^2 = 14.347$, $p = 0.001$).

In addition, chronic kidney disease (CKD) showed a significant association with hypertension. Among patients who tested positive for CKD, 87.5% were hypertensive compared to 39.0% among those without CKD ($\chi^2 = 7.619$, $p = 0.006$).

On the other hand, comorbidities such as diabetes, HIV, hepatitis C (HVC), and hepatitis B (HVB) showed no associations amid hypertension in this study.

Table 6. Bivariate analysis of anthropometric measurements associated with hypertension in patients attending the OPD in Gisenyi District Hospital and Rwamagana Provincial Hospital

Particulars	**Hypertension**		**Chi-square**	**P-value**
	No (%)	**Yes n(%)**		
Height (cm)			3.274	0.195
Short stature: <160 cm	48(63.2)	28(36.8)		
Average stature: 160–174 cm	114(56.4)	88(43.6)		
Tall stature: >=175 cm	25(71.4)	10(28.6)		

Weight (kg)			28.286	**0.001**
< 60 kg (lighter)	63(70.0)	27(30.0)		
60–79.9 kg (reference / average)	113(63.5)	65(36.5)		
? 80 kg (higher)	11(24.4)	34(75.6)		
BMI			17.647	**0.001**
Below 18.5	7(87.5)	1(12.5)		
Between 18.5-24.9	169(63.1)	99(36.9)		
30.0 and above	11(29.7)	26(70.3)		
Total =313				

Source: Primary data, 2025

The analysis showed that weight was linked to hypertension ($\chi^2 = 28.286$, $p = 0.001$). Patients weighing ≥80 kg had the prevalence which is the higher (75.6%), compared to 36.5% among those weighing 60–79.9 kg and 30.0% among those weighing less than 60 kg. Similarly, body mass index (BMI) demonstrated a strong association with hypertension ($\chi^2 = 17.647$, $p = 0.001$). Among obese participants (BMI ≥30.0), 70.3% were hypertensive, compared to 36.9% of those with normal BMI (18.5–24.9) and only 12.5% among the underweight group (BMI <18.5). In contrast, height showed no associations amid hypertension in this study.

Table 7. Multivariate Analysis of factors linked to hypertension in adult patients attending the OPD in Gisenyi District Hospital and Rwamagana Provincial Hospital

Particulars	**AOR**	**95% C.I**		**P-value**
		Lower	Upper	
Age				
18–39	Ref.			
40–59	3.506	2.128	5.776	0.001
>=60				
Marital status				
Single	Ref.			
Married	3.230	1.861	5.603	0.001
Divorced/Widow				
Are you currently a daily smoker of tobacco products?				
Yes	4.376	1.361	14.070	0.013
No	Ref.			
At which frequency do you consume alcohol?				
Daily	4.754	1.449	15.603	0.010
Weekly				
Occasionally	Ref.			
At which frequency do you eat fruit?				
Always	Ref.			

Sometimes	2.542	1.561	3.205	0.012
Occasionally				
At which frequency are you eating vegetables?				
Always	Ref.			
Sometimes	2.291	1.078	4.866	0.031
Occasionally				
At which frequency of eating added salt?				
Always	3.187	1.150	6.429	0.007
Sometimes				
Occasionally				
Never	Ref.			
Do you do physical activity?				
Yes	Ref.			
No	3.695	2.292	5.956	0.001
At which frequency are you doing physical activity?				
Every day	Ref.			
Three days per week	1.143	1.487	2.315	0.241
Two days per week				
More than three days per week	1.400	1.459	3.881	0.162
Every weekend				
Never	3.065	2.891	8.414	0.006
Are you currently taking any blood pressure medication?				
Yes	9.150	3.058	27.374	0.001
No	Ref.			
Does anyone in your family have hypertension?				
Yes	2.677	1.595	4.495	0.001
No	Ref.			
Have you tested positive for CKD?				
Yes	2.941	1.329	6.055	0.001
No	Ref.			
Weight (kg)				
< 60 kg (lighter)	Ref.			
60–79.9 kg (reference / average)	1.342	0.779	2.313	0.289
? 80 kg (higher)				
BMI				
Below 18.5	Ref.			
Between 18.5-24.9				
30.0 and above	4.545	1.814	12.930	0.001

Source: Primary data, 2025

The multivariate logistic regression model revealed that hypertension among adult outpatients was independently influenced by a combination of demographic, behavioral, clinical, and anthropometric factors. Advancing age emerged as a major determinant of hypertension. Adults aged 40–59 years were more than three times as likely to be hypertensive compared with those aged 18–39 years (AOR = 3.506; 95% CI: 2.128–5.776; p = 0.001). The likelihood of hypertension increased further among individuals aged 60 years and above, indicating a clear age-related gradient in risk.

Marital status showed a significant association with hypertension. Compared with single participants, married individuals had over threefold higher odds of hypertension (AOR = 3.230; 95% CI: 1.861–5.603; p = 0.001). The risk was even greater among divorced or widowed participants, suggesting that social and psychosocial factors linked to marital transitions may contribute to elevated blood pressure. With respect to lifestyle behaviors, daily tobacco use was strongly associated with hypertension. Participants who smoked tobacco every day had more than four times the odds of being hypertensive compared with non-smokers (AOR = 4.376; 95% CI: 1.361–14.070; p = 0.013). Likewise, daily alcohol intake significantly increased hypertension risk, with daily drinkers exhibiting nearly fivefold higher odds than occasional consumers (AOR = 4.754; 95% CI: 1.449–15.603; p = 0.010). Several dietary factors were independently linked to hypertension. Participants who reported irregular fruit consumption were significantly more likely to be hypertensive than those who consistently consumed fruits. Specifically, those who consumed fruits sometimes had more than twice the odds of hypertension (AOR = 2.542; 95% CI: 1.561–3.205; p = 0.012), while occasional fruit consumers demonstrated an even higher risk. A similar pattern was observed for vegetable intake, as participants who did not consume vegetables regularly had significantly increased odds of hypertension compared to those who consumed vegetables daily (AOR = 2.291; 95% CI: 1.078–4.866; p = 0.031). Additionally, frequent addition of salt to meals was associated with elevated hypertension risk, with individuals who always added salt having over three times higher odds compared with those who never added salt (AOR = 3.187; 95% CI: 1.150–6.429; p = 0.007). Physical activity demonstrated a strong protective effect. Participants who reported no engagement in physical activity were nearly four times more likely to be hypertensive than those who were physically active (AOR = 3.695; 95% CI: 2.292–5.956; p = 0.001). Furthermore, individuals who never exercised had approximately threefold increased odds of hypertension compared with those who exercised daily (AOR = 3.065; 95% CI: 2.891–8.414; p = 0.006). Among clinical characteristics, current use of antihypertensive medication was strongly associated with hypertension, reflecting the presence of diagnosed and managed disease (AOR = 9.150; 95% CI: 3.058–27.374; p = 0.001). A positive family history of hypertension significantly increased the likelihood of hypertension, with affected individuals having nearly three times higher odds than those without such a history (AOR = 2.677; 95% CI: 1.595–4.495; p

= 0.001). In addition, participants diagnosed with chronic kidney disease (CKD) were almost three times more likely to be hypertensive compared to those without CKD (AOR = 2.941; 95% CI: 1.329–6.055; p = 0.001). Finally, anthropometric indicators were important predictors of hypertension. Individuals with body weight of 80 kg or more had substantially higher odds of hypertension compared with those weighing less than 60 kg. Obesity was particularly influential, as participants with a body mass index of 30.0 kg/m² or higher were more than four times as likely to be hypertensive compared to underweight individuals (AOR = 4.545; 95% CI: 1.814–12.930; p = 0.001).

Discussion

This study assessed the prevalence and determinants of hypertension among adults attending two district-level hospitals in Rwanda. The findings revealed a substantial burden of hypertension, 40.3%, which is notably higher than estimates from earlier community-based studies in Rwanda (Nahimana et al., 2018b). This difference may reflect the hospital-based nature of the sample, where individuals seeking care are more likely to present with symptoms, comorbidities, or undiagnosed elevated blood pressure. As Rwanda continues to experience an epidemiological transition, these results underscore the increasing prominence of hypertension among outpatient populations.

Interpretation of Key Findings

Age and Hypertension

Older adults (≥60 years) had significantly higher odds of hypertension than younger adults. This pattern is well-established and biologically plausible: vascular stiffness, endothelial dysfunction, and cumulative exposure to behavioral risk factors increase with age. In Rwanda, where life expectancy has improved and chronic disease screening remains limited, many older adults may remain undiagnosed until they reach hospital settings. This highlights the need for targeted screening in older age groups at the community and primary care levels.

Behavioral Risk Factors: Smoking and Alcohol

Daily smoking and daily alcohol consumption were strongly associated with hypertension. Tobacco and alcohol use accelerate vascular damage, elevate sympathetic activity, and contribute to metabolic disorders, consistent with studies globally (Prabhakaran et al., 2017). In Rwanda, alcohol consumption remains socially normalized in many communities, and tobacco use, especially among younger men, is increasing. These cultural and behavioral trends may contribute to the high proportion of untreated or poorly managed hypertension. This calls for

strengthened national behavioral risk reduction programs and integration of lifestyle counseling into routine outpatient care.

Dietary Sodium Intake

Participants who frequently added salt to food had markedly higher odds of hypertension. Excess sodium intake increases intravascular volume and blood pressure. In the Rwandan context, many households rely on traditional diets rich in salted foods or use salt to preserve food in areas with limited refrigeration. Awareness about the dangers of excess salt remains low. Health promotion efforts should therefore emphasize salt reduction as a low-cost intervention for hypertension prevention.

Physical Inactivity

Physical inactivity was associated with nearly fourfold increased odds of hypertension. Rapid urbanization in Rwanda, characterized by sedentary jobs, increased motorized transport, and limited recreational spaces, may contribute to reduced physical activity levels among adults. These structural changes call for multisectoral interventions, including urban planning that promotes safe walking/cycling and workplace wellness programs.

Family History and Obesity

Both family history of hypertension and obesity (BMI ≥30) were strong predictors of hypertension, consistent with evidence from Ethiopia and other African settings (Abebe et al., 2015). Genetic predisposition, coupled with lifestyle changes such as increased use of processed foods and reduced physical activity, may explain these associations. Obesity is rising in Rwanda, especially in urban settings; thus, routine BMI assessment and counseling should be integrated into all outpatient visits.

Implications for Rwanda

The combined influence of demographic, behavioral, and clinical factors shows that hypertension in Rwanda is shaped by both lifestyle transitions and structural determinants such as urbanization and limited health education. Strengthening early detection, improving management protocols, and promoting culturally appropriate lifestyle modifications are critical. Additionally, integrating hypertension screening into every OPD visit could significantly increase early diagnosis rates.

Limitations

This study has several limitations that should be considered:

1. Cross-sectional design: Causality cannot be established. The relationships observed reflect associations at one point in time.
2. Hospital-based sample: Participants were recruited from two hospitals only, limiting generalizability to the broader national population. Individuals seeking care may have more symptoms or comorbidities, potentially overestimating prevalence.
3. Self-reported data: Variables such as diet, alcohol intake, smoking, and physical activity relied on self-reporting and may be affected by recall bias or social desirability bias—particularly regarding alcohol and tobacco use, which are sensitive in Rwanda.
4. Single-time measurements: Blood pressure and anthropometric data were measured once during the visit. This may not fully capture daily or long-term variations, possibly leading to misclassification.
5. Unmeasured confounders: Factors such as stress, socioeconomic gradients, and medication adherence were not assessed and could influence hypertension prevalence.

Despite these limitations, the study provides important evidence on modifiable and non-modifiable risk factors for hypertension in Rwanda and is among the few hospital-based assessments focusing on the 18–64 age group.

Conclusion

This study demonstrates that hypertension is highly prevalent among adult outpatients at Gisenyi District Hospital and Rwamagana Provincial Hospital, with 40.3% of participants found to be hypertensive. Several factors, including older age, daily smoking, daily alcohol consumption, frequent use of added salt, physical inactivity, family history of hypertension, and obesity (BMI ≥30), were identified as significant predictors of hypertension. These findings highlight the urgent need for routine blood pressure screening, strengthened lifestyle modification programs, and targeted interventions for high-risk groups to reduce the burden of hypertension and its related complications in Rwanda.

Recommendations

Importantly, this study contributes to the limited body of hospital-based hypertension research in Rwanda, offering insights distinct from community-based surveys by focusing specifically on adults seeking outpatient care. The comparative analysis between two hospitals in different provinces provides valuable evidence to inform localized prevention and management strategies.

Future Research Directions

Future studies should consider:

- Conducting longitudinal research to better understand causal relationships and progression of hypertension over time.
- Expanding to multi-center, nationally representative samples to improve generalizability.
- Exploring qualitative perspectives on health-seeking behaviors, medication adherence, and barriers to lifestyle change.
- Examining additional determinants such as stress, diet composition, socioeconomic disparities, and access to healthcare services.
- Assessing the effectiveness of targeted interventions such as community screening programs or lifestyle counseling.

Such research will further strengthen national strategies aimed at preventing and managing hypertension and contribute to a more comprehensive understanding of cardiovascular health in Rwanda.

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