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Research Article

A Cross-sectional Study on Lifestyle Factors Related to High Blood Pressure Among Medical Students in the City of Goma in the Democratic Republic of Congo

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Abstract

High blood pressure (HBP) is a long-term health condition that elevates the risk of premature death in the general population. This research sought to evaluate how widespread hypertension is and to identify lifestyle-related risk factors among students at the University of Goma in the Democratic Republic of Congo (DRC). A cross-sectional survey was conducted, and data were collected using a questionnaire. A total of 306 students participated in the survey; 52.6% were male. Results showed that 31.4% of participants had HBP (systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg). Risk factors associated with hypertension included obesity (OR: 0.51; 95% CI: 0.292-0.893; p=0.019), alcohol consumption (OR: 0.299; 95% CI: 0.181-0.495; p<0.001), family history of hypertension (OR: 0.411; 95% CI: 0.25-0.676; p<0.001), personal history of hypertension (OR: 0.241; 95% CI: 0.092-0.634; p=0.004), and sleep duration (OR: 8.043; 95% CI: 4.51-14.346; p<0.001). In conclusion, the prevalence of HBP was high and was associated with several lifestyle factors among students at the University of Goma.

Keywords

Lifestyle, Hypertension, Students

1. Introduction

The Democratic Republic of Congo (DRC) is a resource-limited country. Despite its abundant mineral wealth, parts of the country have faced war-related instability for over 30 years. As such, the DRC is not immune to the global burden of non-communicable diseases, including high blood pressure (HBP). HBP is a leading public health concern across

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Africa and in the Congolese population [1, 2].

Cardiovascular mortality is twice as high in individuals with HBP compared to those with normal blood pressure, due to a significantly increased risk of stroke (7 times higher), heart failure (4 times higher), coronary artery disease (3 times higher), and peripheral artery disease (2 times higher). A reduction of 5-6 mmHg in diastolic blood pressure (DBP) and 10 mmHg in systolic blood pressure (SBP) can reduce the risk of stroke by one-third and coronary artery disease by one-sixth [5, 6].

In 2017, approximately 1.13 billion people worldwide were living with hypertension, a number expected to reach 1.56 billion by 2025. Prevalence varies by region. Studies have shown different rates among students: 15.56% in India [7], 20.4% in Thailand [8], 17.9% in Ethiopia [9], 19.93% in Nigeria [10], and 19.91% in Ghana [11].

Cardiovascular risk increases when SBP exceeds 115 mmHg and DBP exceeds 75 mmHg, regardless of gender, age, ethnicity, or country. The risk increases linearly with rising BP, even at relatively low values.

Though often asymptomatic and not immediately life-threatening, high blood pressure has long-term consequences. Early onset HBP in young adults is associated with cardiovascular mortality and cognitive decline later in life [12, 13].

University students represent a unique population for public health interventions due to their shared environments and accessible healthcare settings. BP monitoring is inexpensive and feasible in such settings, and preventive programs could be scaled to other institutions [14]. In the DRC, however, there is a lack of data on HBP among university students. This study aimed to evaluate the prevalence of HBP and identify associated lifestyle factors among students at the University of Goma.

2. Materials and Methods

2.1. Survey Design

A cross-sectional design was used to assess the association between student lifestyle and the risk of HBP in eastern DRC. While this design allows for the identification of associations, it does not establish causality.

2.2. Study Setting

The study took place at the University of Goma, located in eastern DRC, during a cardiovascular disease screening campaign from March 1 to March 30, 2024. The University has eight faculties and attracts students from various provinces and neighboring countries. The campaign included health awareness, diagnostics, and education.

2.3. Participants

Inclusion Criteria:

1) Adults aged 18 years and older
2) Students regularly enrolled at the School of Medicine for at least one academic year
3) Voluntary participation with informed consent

Exclusion Criteria:

1) Individuals not enrolled at the University during the study period
2) Students who declined to participate or provide consent

2.4. Participant Recruitment

Participants were recruited using a consecutive, non-probabilistic sampling method. Announcements were made via social media, posters, and student representatives. Students reported to a designated room where they completed a questionnaire and had their blood pressure measured.

BP was measured twice, at least 5 minutes apart, after 5 minutes of rest. The participant remained silent and seated with their arm at heart level. Two cuff sizes were used to accommodate arm sizes. HBP was defined as SBP $\geq$ 140 mmHg and/or DBP $\geq$ 90 mmHg at both readings.

2.5. Data Collection Tools

1) Questionnaires were used to collect personal data, lifestyle habits (diet, physical activity, smoking, alcohol), and medical history.
2) Data were collected using Google Forms.

Variables

Outcomes:

1) Presence of high blood pressure
2) Personal and family history of HBP
3) Sleep duration

Exposures:

1) Demographic data (age, gender)
2) Lifestyle factors: alcohol use, tobacco smoking, obesity, diet (e.g., fruit/vegetable and salty food consumption), and screen time (e.g., TV viewing)

2.6. Bias Mitigation

Investigators were trained final-year medical students and medical trainees. The questionnaires were pre-tested to reduce reporting errors and improve reliability.

2.7. Statistical Methods

2.7.1. Study Size

The sample size was calculated based on an estimated 20% prevalence, a 95% confidence level, and a 5% margin of error.

2.7.2. Quantitative Variables

Variables like age and sleep duration were categorized in-

to clinically relevant groups for analysis.

2.8. Descriptive Analysis

Categorical variables were reported as frequencies and percentages. Continuous variables were expressed as means and standard deviations.

2.9. Inferential Analysis

Logistic regression was used to analyze associations between risk factors and HBP. Analyses were conducted using SPSS version 27.

2.10. Sensitivity Analysis

Participants with incomplete data were excluded to assess the consistency of results.

2.11. Ethical Considerations

The study was approved by the Faculty of Medicine, University of Goma, and the hospital ethics committee (approval number: NDH16/08/U1025CMK). Informed consent was obtained from all participants. Confidentiality and the right to withdraw at any time were guaranteed.

3. Results

Table 1. *Demographic and clinical profile of participants based on high blood pressure status.*

		HBP			
		Total (n=306)	**no (n=210)**	**Yes (n=96)**	**p-value**
Age groups	< 30 years	292 (95,4%)	203 (66,3%)	89 (29,1%)	0,144
	≥ 30 years	14 (4,6%)	7 (2,3%)	7 (2,3%)	
Gender	Male	161 (52,6%)	103 (33,7%)	58 (19%)	0,084
	Female	145 (47,4%)	107 (35%)	38 (12,4%)	
Family history of HBP	No	194 (63,4%)	147 (48%)	47 (15,4%)	<0,001
	Yes	112 (36,6%)	63 (20,6%)	49 (16%)	
Personal History of HBP	No	287 (93,8%)	203 (66,3%)	84 (27,5%)	0,003
	Yes	19 (6,2%)	7 (2,3%)	12 (3,9%)	
Personal History of diabete	No	305 (99,7%)	209 (68,3%)	96 (31,4%)	1
	Yes	1 (0,3%)	1 (0,3%)	0 (0,0%)	
Obesity	No	239 (78,1%)	172 (56,2%)	67 (21,9%)	0,025
	Yes	67 (21,9%)	12,40%	29 (9,5%)	
SBP (mmHg) Mean ± standard deviation		126,5 ±17,6	126,5 ±17,5	126,6 ±17,6	<0,001
DBP (mmHg) Mean ± standard deviation		78,1 ±12,1	78,07 ±12,3	78,2 ±12,1	<0,001

Based on the table, among the 306 participants interviewed, 31.4% have high blood pressure (HBP). Males represent 52.6% of the total sample, and a significantly higher proportion of them have HBP compared to females ($p < 0.05$). A family and personal history of HBP, as well as obesity, are significantly associated with the presence of HBP ($p < 0.05$). Both systolic and diastolic blood pressure levels are significantly higher in students with HBP ($p < 0.001$).

Table 2. *Participant distribution based on lifestyle habits and their association with high blood pressure.*

		HBP			
		Total (n=306)	**No (n=210)**	**Yes (n=96)**	**p-value**
Physical exercise	No	121 (39,5%)	78 (25,5%)	43 (14,1%)	0,21
	Yes	185 (60,5%)	132 (43,1%)	53 (17,3%)	
Fruit and vegetable consumption	No	15 (4,9%)	13 (4,2%)	2 (0,7%)	0,158
	Yes	291 (95,1%)	197 (64,4%)	94 (30,7%)	
Alcohol consumption	No	173 (56,5%)	138 (45,1%)	35 (11,4%)	<0,001
	Yes	133 (43,5%)	72 (23,5%)	61 (19,9%)	
Eat salty meals	No	12 (3,9%)	10 (3,3%)	2 (0,7%)	0,352
	Yes	294 (96,1%)	200 (65,4%)	94 (30,7%)	
Watch TV	No	49 (16%)	37 (12,1%)	12 (3,9%)	0,314
	Yes	257 (84%)	173 (56,5%)	84 (27,5%)	
Smoke tobacco	No	303 (99%)	210 (68,6%)	93 (30,4%)	0,034
	Yes	3 (1%)	0 (0,0%)	3 (1%)	
Sleep time	≤7H	75 (24,5%)	25 (8,2%)	50 (16,3%)	<0,001
	≥8H	231 (75,5%	185 (60,5%)	46 (15%)	

These observations indicate that alcohol consumption, cigarette smoking, and sleeping ≤7 hours were statistically significantly associated with the presence of high blood pressure (HBP) among students ($p < 0.05$).

Table 3. *Univariate and bivariate evaluation of factors associated with high blood pressure among students.*

		Univariate Analysis		**bivariate Analysis**	
		p-value	**OR (IC95%)**	**p**	**OR (IC 95%)**
Age groups (1)	< 30 years	0,144	0,438 (0,149-1,287)	0,133	2,281 (0,777-6,696)
	≥ 30 years	-	-	-	-
Gender (1)	Male	0,084	0,631 (0,386-1,030)	0,065	1,586 (0,971-2,589)
	Female	-	-	-	-
Obesity (1)	Yes	0,025	1,959 (1,119-3,429)	0,019	0,51 (0,292-0,893)
	No	-	-	-	-
Physical exercise (1)	Yes	0,21	0,728 (0,446-1,189)	0,205	1,373 (0,841-2,241)
	No	-	-	-	-
Fruit and vegetable consumption (1)	Yes	0,17	4,571 (0,776-26,923)	0,141	0,322 (0,071-1,458)
	No	-	-	-	-
Alcohol consumption (1)	Yes	0,001	6,147 (2,070-18,255)	0,000	0,299 (0,181-0,495)
	No	-	-	-	-
Watch TV (1)	Yes	0,314	1,497 (0,742-3,019)	0,259	0,668 (0,331-1,347)
	No	-	-	-	-

		Univariate Analysis		bivariate Analysis	
		p-value	**OR (IC95%)**	**p**	**OR (IC 95%)**
Eat salty meals (1)	Yes	0,352	2,35 (0,505-10,938)	0,276	0,426 (0,091-1,981)
	No	-	-	-	-
Smoke tobacco (1)	Yes	0,03	0,307 (0,259-0,364)	0,999	0 (0)
	No	-	-	-	-
Family history of HBP (1)	Yes	<0,001	2,433 (1,480-4,000)	0,000	0,411 (0,25-0,676)
	No	-	-	-	-
Personal History of HBP (1)	Yes	0,003	4,143 (1,576-10,887)	0,004	0,241 (0,092-0,634)
	No	-	-	-	-
Personal History of diabete (1)	Yes	1	0,645 (0,635-0,739)	1	742030394 (0)
	No	-	-	-	-
SBP (mmHg)	≥140	<0,001	0,038 (0,006-0,263)	0,958	297305,997 (0-1,74E+207)
	< 140	-	-	-	-
DBP (mmHg)	≥90	<0,001	0,375 (0,251-0,559)	0,000	1,539 (1,368-1,731)
	<90	-	-	-	-
Sleep time (1)	≤7 hours	<0,001	0,124 (0,070-0,222)	0,000	8,043 (4,51-14,346)
	≥8 hours	-	-	-	-

Following univariate and subsequent bivariate analyses, the factors that remained statistically associated with HBP ($p < 0.05$) were obesity, alcohol consumption, family and personal history of HBP, and sleeping less than 7 hours per night. A statistically significant association was also observed between elevated SBP and DBP levels and the presence of HBP in students.

4. Discussion

In this survey, the prevalence of hypertension among all medical students who participated in the one-off screening was 31.4%. Our findings are comparable to those of Olotu J. E. et al. [15], who reported a prevalence of 31.7% among students at the University of Port Harcourt. Similarly, our results are higher than those reported by Alinaitwe et al. [16], who found a prevalence of 26.2% in Ugandan students; by Gebremeskel G. G. et al. [9], who reported 17.9% among young Ethiopian students; and by Amponsem-Boateng C. et al. [11], who found a prevalence of 19.91% in Ghana.

This relatively high prevalence of hypertension among young university students may have significant implications for public health systems and the future well-being of this demographic unless appropriate preventive measures are implemented.

Our study also revealed a prevalence of 19% among male students and 12.4% among female students. A similar trend was observed in Ethiopia, where the prevalence was higher among males (62.79%) than females (37.21%) [9]. Research conducted in Ivorian universities by Boka C. et al. [17] also indicated a male predominance, with a prevalence of 66.6%. This gender disparity may be linked to factors such as demographic transition, lifestyle choices, and the presence of mental health symptoms, unhealthy behaviors, and a higher risk of developing hypertension.

Our findings indicate a statistically significant correlation between obesity and hypertension ($p < 0.05$), which aligns with existing research demonstrating that BMI is independently and nearly linearly associated with blood pressure.

This is further supported by a study of the African diaspora, which showed considerable variation in hypertension prevalence despite shared ancestral genes: 10% among rural Cameroonians (average BMI: 22 kg/m^2) [18], 25% among Jamaicans (average BMI: 25 kg/m^2), and 40% among African Americans in Illinois (average BMI: 35 kg/m^2) [19].

In terms of physical activity, 60.5% of hypertensive individuals in our sample reported engaging in physical activity, while 39.5% did not. A meta-analysis of 54 clinical trials found that aerobic exercise led to an average reduction in systolic blood pressure (SBP) of 3.9 mmHg and diastolic

blood pressure (DBP) of 2.6 mmHg [20]. Numerous studies confirm that regular physical activity plays a vital role in both the prevention and treatment of hypertension [21]. Even modest reductions in blood pressure have been shown to significantly lower mortality from stroke and coronary heart disease [3, 4, 22]. Our findings support this evidence, suggesting that physical exercise may act as a protective factor against hypertension.

Consumption of fruits and vegetables also emerged as a protective factor. In our study, 95.1% of hypertensive participants consumed fruits and vegetables, while only 4.9% did not. Prior research has shown that a diet rich in fruits and vegetables can reduce the risk of hypertension by up to 11% in high consumers (≥800 g/day) compared to low consumers [8, 10, 11].

Alcohol consumption was found to be significantly higher among hypertensive participants, confirming its well-established role in increasing blood pressure. Several studies have shown that the relationship is dose-dependent and that even moderate alcohol intake can elevate blood pressure. Binge drinking, in particular, has a pronounced impact. Encouragingly, alcohol-induced hypertension is often reversible with reduced intake [23]. Blood pressure tends to decrease significantly in heavy drinkers who reduce their alcohol consumption [10, 17, 23].

Our analysis also identified family history and personal history of hypertension as significant risk factors among students at the University of Goma. Both univariate and bivariate analyses supported this finding. These results are consistent with prior studies suggesting that a familial predisposition—especially when both parents are affected—is an independent risk factor. Research indicates that approximately 60% of this predisposition is genetically determined, with the remaining 40% attributed to environmental factors [8, 11, 12]. A personal history of hypertension also highlights an issue of underdiagnosis and lack of awareness among young adults. According to an INSERM study, hypertension is often silent: only 50% of affected individuals are aware of their condition, and among those, only half receive treatment [8, 12, 19].

Our findings suggest that sleeping less than seven hours per night is associated with a higher risk of hypertension among young adults. This is supported by a meta-analysis by Wang Y. et al. [24] and a study conducted by Yameogo N. V. et al. in Burkina Faso [25]. Several other studies confirm that sleep duration plays a crucial role in the development of hypertension among both young individuals and the general population [26, 27].

5. Conclusion

In conclusion, this study highlights hypertension as a significant public health concern among university students, with an overall prevalence of 31.4%—19% in males and 12.4% in females. Key risk factors identified include obesity, alcohol consumption, smoking, inadequate sleep, and family/personal history of hypertension. These findings underscore the urgent need for preventive interventions and early screening among young populations.

Abbreviations

DBP	Diastolic Blood Pressure
DRC	Democratic Republic of Congo
HBP	High Blood Pressure
OR	Odds Ratio
SBP	Systolic Blood Pressure

Author Contributions

Charles Kahindo Kangitsi: Conceptualization, Data collection, Formal Analysis, Funding, Investigation, Project administration, Methodology, Writing – original draft, Writing – review & editing

Yemba Baruani Ahuka Albert: Conceptualization, Methodology, Writing – review & editing

Larry Kasereka Kamabu: Data analysis, Methodology, Supervision, Writing – review & editing

Charles Lwanga Bandima: Conceptualization, Methodology, Supervision, Writing – review & editing

François Polepole Maheshe: Conceptualization, Methodology, Supervision, Writing – review & editing.

Zacharie Tsongo Kibendelwa: Conceptualization, Funding Acquisition, Methodology, Supervision, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest related to this research. The study was conducted independently, without commercial, financial, or political influence.

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