

## Research Article

# Uncontrolled Hypertension and Behavioral Risk Factors among Adult Hypertensive Patients at Saint Paul's Hospital, Millennium Medical College, Addis Ababa, Ethiopia

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**Introduction.** Uncontrolled hypertension is a state of systolic blood pressure  $\geq 140$  mm Hg and/or diastolic blood pressure  $\geq 90$  mm Hg even though the patients are on antihypertension. The WHO states that it is the most prevalent risk factor for death and disability worldwide, particularly in developing nations. The goal of the current study was to investigate behavioral risk factors for uncontrolled hypertension among adult hypertensive patients in Ethiopia. **Methods.** From October to November 2020, a cross-sectional study design was carried out in the hypertension follow-up clinic at Saint Paul's Hospital, Millennium Medical College. The choice of 474 study participants was made using a straightforward random sampling method. A semistructured questionnaire was used to obtain data through a chart review as well as an interview. The data were coded before being imported into Epi-data version 7.0 and exported to SPSS version 25 for analysis. To determine the factors associated with uncontrolled hypertension, a multivariate logistic regression model (AOR, 95% CI, and  $p$  value 0.05) was used. **Result.** This study found that 52.1% of hypertensive patients had uncontrolled hypertension. Among hypertensive patients who are alcoholics, smokers, or salt consumers, the odds of having uncontrolled hypertension are AOR = 16.7, 95% CI = (8.13–34.346); AOR = 7.4, 95% CI = (1.211–45.29); and AOR = 13.4, 95% CI = (7.355–25.098), respectively. Uncontrolled hypertension is 3 (AOR and 95% CI) and 1.5 (AOR and 95% CI) times more prevalent in illiterates and obese people, correspondingly. Hypertensive patients from urban areas, those who did not engage in physical activity, and those who were overweight had uncontrolled hypertension odds that were 0.55, 0.43, and 0.25 (AOR and 95% CI) times lower, respectively. **Conclusion.** Uncontrolled hypertension is very common among adult hypertensive patients at the hospital. Behavioral practices and lifestyles factors have a strong association with uncontrolled hypertension. Health education and awareness are on the effect of poor behavior practices and lifestyles to increase adherence to hypertension-controlling medical advice.

## 1. Introduction

When the systolic blood pressure (SBP) is greater than or equal to 140 mm Hg and/or the diastolic blood pressure (DBP) is greater than or equal to 90 mm Hg, the condition is referred to as hypertension [1]. These calculations are based on the average of at least two carefully measured blood pressure (BP) measurements taken during each of at least

two visits by hypertensive patients to a hypertension clinic [2]. While, uncontrolled hypertension is characterized as having a blood pressure (BP) reading of at least 140/90 mmHg in hypertensive people on medication [3].

Although substantial efforts have been made to identify and treat hypertension, the usually recommended target blood pressure (BP) of less than 140/90 mmHg [4] has not been reached. The most frequent risk factor for death and the

leading cause of disability worldwide is uncontrolled hypertension, which affects almost one billion people worldwide [5]. While, only 6% of hypertensive patients in the UK have achieved controlled hypertension and less than 30% of hypertensive patients in the United States have blood pressure readings lower than 140/90 mmHg. Data from countries like Australia, Canada, Finland, India, Scotland, and Spain indicate that just 20% of people would succeed in achieving this aim [6]. The prevalence of controlled hypertension was less than 30.5% in sub-Saharan Africa (SSA), according to a meta-analysis [7]. The combined prevalence of uncontrolled hypertension throughout the 13 studies was 48% in Ethiopia [8].

Multiple factors were discovered to contribute to uncontrolled hypertension, despite the inconsistent findings of studies. Uncontrolled hypertension is mostly caused by noncompliance with antihypertensive medication, non-adherence to the DASH diet and high salt intake, as well as alcohol consumption, smoking, physical inactivity, and obesity and overweight [9]. Uncontrolled hypertension is also linked to other characteristics like sex, age, the duration of the condition, and comorbidities [2]. Poor hypertension control is also influenced by factors such as inadequate medicine, factors relating to doctors' knowledge and perception of control recommendations, and factors relating to patients' self-management practices and awareness and perception of the disease [10].

The World Health Organization (WHO) reports that hypertension is a significant risk factor for cardiovascular disease, renal impairment, peripheral vascular disease, and blindness, causing 7.5 million deaths globally each year or about 12.8% of all deaths [5]. The most detrimental result of poorly treated hypertension was cardiovascular-related morbidity and mortality [11]. The fact that uncontrolled hypertension is worse in least developed nations like Ethiopia indicates that screening and follow-up are not being done to their full potential. Additionally, the burden of uncontrolled hypertension has a severe impact on the nation's limited healthcare budget. The goal of this study was to identify the behavioral risk factors and prevalence of uncontrolled hypertension among patients with hypertension at St. Paul's Hospital and Millennium Medical College.

## 2. Methods and Materials

*2.1. Study Design, Population, Period, and Area.* A cross-sectional study conducted on an institutional basis from October to November 2020 among adult hypertensive patients receiving follow-up care at hypertension clinics at St. Paul's Hospital, Millennium Medical College, Addis Ababa, Ethiopia.

*2.2. Sample Size and Sampling Technique.* We chose 497, which is the larger sample size, after determining the sample size for the prevalence of uncontrolled hypertension and certain related variables independently. Subsequently, after screening for all hypertensive patients' charts and those on active follow-up, we selected 994 hyperattentive patients'

charts excluding pregnant women and hypertension patients with diabetes mellitus and chronic kidney disease based on their HMS records. Then, we sequenced the charts from 1 to 994 using their chart numbers to select 497 of the patients from every two patient charts starting with the 2<sup>nd</sup> chart that was selected by the lottery method from the list of 1 to  $k$ th. The value of  $K$  is calculated to be 2 by dividing the total population (994) by the sample size (497). The participants were then followed as they were on follow-up.

*2.3. Data Collection Tools and Procedure.* Data were gathered through face-to-face interviews utilizing a semistructured questionnaire and document review by examining prior blood pressure records. A healthcare professional assessed blood pressure (BP) using a single calibrated and certified digital sphygmomanometer. The readings were recorded as three serial measurements spaced 15 minutes apart. Each measurement was made on the participant's left upper arm while they were seated. The analysis used the mean of the most recent two blood pressure readings. Following the taking of physical measurements, including weight and height, the body mass index was determined.

*2.4. Data Processing and Analysis.* The Statistical Package for the Social Sciences (SPSS) version 25 software was used to code, input, and clean the data before exporting it for statistical analysis.

In order to evaluate the participant's BP control status and determine participant demographic and health characteristics, descriptive statistics (frequency, percentages, mean values, and standard deviations (SDs)) were computed. The prevalence of uncontrolled hypertension was estimated based on a study of the patient's medical record and blood pressure measurements. For categorical variables, results were presented as cross-tabulation percentages, and for continuous variables, as means with SD. To investigate the link between the result variable and the independent factors, bivariate analyses were performed. In multivariable analyses utilizing logistic regression with  $P$  value 0.05 as the cutoff for statistical significance, factors for which significant bivariate associations were taken into account by considering  $P$  value 0.25 were retained and continued. Odds ratios and 95% confidence intervals (CIs) were used to assess the significance of associations and gauge the strength of the relationships between dependent and independent factors.

*2.5. Data Quality Assurance.* One week prior to the actual data collection, a tool was used to pretest it at St. Peter Hospital in order to improve its capacity to elicit pertinent information and to verify its completeness and consistency. The pretest comprised 5% of the total sample size. Corrective action was then conducted prior to the actual data collection, and data collectors also received training. The Amharic translation of the questionnaire has been completed. Last but not least, the supervisors and the primary investigator closely monitored the data collectors.

**2.6. Operational Definitions.** Uncontrolled hypertension is defined as having a systolic blood pressure of at least 140 mm Hg and/or a diastolic blood pressure of at least 90 mm Hg in individuals who have been taking prescribed antihypertensive medication for at least six months.

**Medication-adherence:** Status was assessed as “Do you take your prescribed antihypertensive drugs at the same time every day?” Respondents who reported yes, every day, were considered to have a good medication adherence.

**Alcohol users:** according to this study, alcohol abstainers were those who said they had not drunk in the previous week or who said they typically did not.

**Smoking:** In this study, individuals who reported having no smoking days per week were considered nonsmokers.

**Adherence to physical activity:** the practice of regularly going to the gym, walking for 30 minutes, or engaging in heavy work.

**Adhering to a low-sodium diet** involves maintaining a balanced diet, avoiding salt in meals, and avoiding foods with a high salt content

**2.7. Ethical Consideration.** The Saint Paul Hospital, Millennium Medical College/SPHMMC/Review Board Research Committee granted ethical clearance. Participation was completely dependent on individuals’ willingness and informed consent. The respondents had the right to decline or stop taking part at any time. Information was anonymously logged. Throughout the whole study, confidentiality and privacy were maintained.

### 3. Results

**3.1. Sociodemographic Characteristics of the Respondents.** There were 497 hypertension patients in total in this study. Of those, 474 participants successfully completed a face-to-face interview with a response rate of 95.4%. Three hundred thirteen (66%) of the 474 survey participants were respondents who lived in cities. The study’s participants were 48.73 years old on average, with a standard deviation of almost 14 years. Participants in the study had an average monthly salary of 2281 ETB (SD of 2328.3 ETB). Patients with hypertension who received a diagnosis at least six to twenty years ago made up the majority of research participants (62.4%) (Table 1).

**3.2. Prevalence of Uncontrolled Hypertension.** The participants’ average systolic blood pressure over three consecutive follow-ups was 133.54 + 13.3 mm Hg, while their average diastolic blood pressure was 77.99 + 13.023 mm Hg. With a 95% confidence interval of 46.7–57.3%, the patients’ three consecutive follow-up average blood pressure readings showed that 247 (52.1%) of them had uncontrolled hypertension overall.

**3.3. Behavioral Practice among Adult Hypertensive Patients at St. Paul’s Hospital, Millennium Medical College.** This study discovered that 206 (43.6%) of the study subjects used alcohol. Of these, 39.7% of patients had uncontrolled hypertension, which represents more than one-third of the group. Sixty-seven (14%) of the study participants were smokers, and 64 (13.5%) of them had uncontrolled hypertension. Similarly, 50 (10.5%) of participants used khat, and 47 (9.9%) of them had uncontrolled hypertension. The majority of study participants (58.2%) did not consume a diet low in salt, and 222 (46.8%) had uncontrolled hypertension. This study also discovered that 201 (42.2%) of the patients who did not exercise had uncontrolled hypertension. Additionally, 146 (30.8%) of patients who did not take their medicine as prescribed and 229 (48.3%) of those who did not follow a healthy eating regimen had uncontrolled hypertension (Table 2).

**3.4. Distribution of Body Mass Index and Number of Anti-hypertensive Drugs Taken among Adult Hypertensive Patients.** It has been found that uncontrolled hypertension affects the majority of obese and overweight hypertensive patients. Similar to this, it has been found that most individuals on two or more antihypertensive drugs have a significant prevalence of uncontrolled hypertension (Table 3).

**3.5. Uncontrolled Hypertension and Associated Factors.** The current study’s bivariate logistic regression analysis revealed that being a male gender increased the likelihood of uncontrolled hypertension. The same is true for being a widow, living in a city, and not having a formal education, which are being statistically linked to uncontrolled hypertension, with  $P$  values less than or equal to 0.25. The multivariable logistic regression model with  $P = 0.05$  was used in a different situation. Uncontrolled hypertension has been found to be substantially correlated with level of education, place of residence, BMI, and self-care behaviors such as alcohol use, smoking, not getting enough exercise, and not following a low-sodium diet.

Table 4 demonstrates that patients with high blood pressure who have not completed a formal education are three times more likely to have uncontrolled hypertension (AOR = 2.9, 95% CI = (1.284–6.848)  $P = 0.011$ ). In comparison to urban residents, hypertension patients from rural areas are less likely to have uncontrolled blood pressure (AOR = .551, 95% CI = (.366–.830)  $P = 0.004$ ). While, the odds of uncontrolled hypertension in overweight and obese patients are 0.25 and 1.5 compared to individuals of normal weight ((AOR = 1.50, 95% CI = (0.08–0.776),  $P = 0.016$ ) and (AOR = 1.5, 95% CI = (1.11–5.341),  $P = 0.004$ ) respectively). The likelihood of uncontrolled hypertension is associated with the behavioral habits of study participants. Alcohol users were 17 times more likely to develop uncontrolled hypertension than abstainers (AOR = 16.7, 95% CI = (8.13–34.346)  $P = 0.001$ ). Similar to this, smokers had a 7.4 times higher likelihood of having uncontrolled HTN than nonsmokers (AOR = 7.4, 95% CI = (1.211–45.29),  $P =$

TABLE 1: Sociodemographic characteristics of hypertensive patients who were attending St. Paul's Hospital, Millennium Medical College, Addis Ababa, Ethiopia, 2020 ( $n = 474$ ).

Variables	Category	Type of hypertension		Total, $n$ (%)
		Controlled, $n$ (%)	Uncontrolled, $n$ (%)	
Sex	Male	100 (21.1)	126 (26.6)	226 (47.7)
	Female	127 (26.8)	121 (25.5)	248 (52.3)
Age in years	<35 years old	60 (12.6)	45 (9.42)	105 (22.2)
	35–55 years old	120 (25.3)	82 (15.3)	202 (42.6)
	>56 years old	17 (15.8)	92 (17.4)	167 (35.2)
Marital status	Single	16 (3.4)	10 (2.1)	26 (5.5)
	Married	150 (31.6)	169 (35.7)	319 (67.3)
	Divorce	14 (3)	11 (2.3)	25 (5.3)
	Widowed	47 (9.9)	57 (12)	104 (21.9)
Level of education	Illiterate	47 (9.9)	65 (13.7)	112 (23.6)
	Primary education	60 (12.7)	32 (6, 8)	92 (19.4)
	Secondary education	84 (17.7)	100 (21.1)	184 (38.8)
	College and above	36 (7, 6)	50 (10.5)	86 (18.1)
Residence	Rural	92 (19.4)	69 (14.6)	161 (34)
	Urban	135 (28.5)	178 (37.6)	313 (66)
Occupation	Unemployed	97 (20.5)	33 (6.9)	130 (27.4)
	Government employed	53 (11.2)	83 (17.5)	136 (28.7)
	Self-employed	66 (13.9)	58 (12.2)	124 (26.2)
	Retired	45 (9.4)	39 (8.3)	84 (17.7)
Income	<1000 ETB	100 (21.1)	102 (21.5)	202 (42.6)
	1001–3000 ETB	111 (23.4)	32 (6.75)	143 (30.2)
	>3001 ETB	83 (17.5)	46 (9.7)	129 (27.2)
Length of diagnosis for HTN	<5 years	92 (19.4)	86 (18.2)	178 (37.6)
	>6 years	150 (31.6)	146 (30.8)	296 (62.4)

HTN, hypertension; ETB, Ethiopian birr.

0.003). Participants who do not follow a low-salt diet are nearly 13 times more likely to have uncontrolled hypertension than those who do (AOR = 13.4, 95% CI = (7.355–25.098),  $P = 0.001$ ) (Table 4).

#### 4. Discussion

The prevalence of uncontrolled hypertension was found to be 52.1% in this study. The individuals' average systolic and diastolic blood pressures over three consecutive follow-up visits were 133.54 + 13.3 and 77.99 + 13.023, respectively. This finding is consistent with the prevalence of uncontrolled hypertension, which is 54.7% in Ghana [12], 52.7% in Ayder Hospital [1], and 51.2% in Jimma Hospital [2] among hypertensive patients. On the contrary, the prevalence of uncontrolled hypertension was found to be lower than in the study conducted in Panama at 66.7% [10], Morocco at 73% [13], Kerala, India at 68.3% [14], and Zimbabwe at 67.2% [10]. This may be because of the sociodemographic and cultural differences of the study participants.

Smokers were shown to be 7 times more likely than nonsmokers to have uncontrolled blood pressure. Research on smokers undertaken in Zimbabwe provides evidence to support this study, demonstrating a substantial link between smoking and uncontrolled hypertension [10]. Additionally, a study in Ethiopia found that people who have used cigarettes throughout their lives are more likely to develop

uncontrolled hypertension than people who have never used tobacco [2]. As a whole, smoking raises blood pressure through increasing peripheral vascular resistance, inducing arterial narrowing, and eventually damaging artery walls. Nicotine in cigarettes acts as an adrenergic agonist, stimulating the sympathetic nervous system and having a hypertensive effect [5].

According to the results of the current investigation, those who did not follow a low-sodium diet had an approximately 13-fold increased risk of uncontrolled hypertension compared to those who did (AOR = 13.4; 95% CI = (7.355–25.098);  $p = 0.001$ ). Other investigations from Zimbabwe [10] and Gondar, Ethiopia, support this finding [15]. The renin-angiotensin system is thought to play a significant role in the pathophysiology of elevated blood pressure because sodium retention increases renal reabsorption.

This study found that, in comparison to alcohol abstinence, alcohol users had uncontrolled blood pressure that was 17 times higher. This fits with some research studies that claim consuming alcohol more than twice or three times per day increases the risk of uncontrolled hypertension [6]. In line with this study, a study done in Bangladesh [13] also supports the current result that drinking alcohol raises the incidence of uncontrolled hypertension. Additionally, a study from Spain found that drinking alcohol was linked to inadequate control of hypertension that matches the conclusions of the current study [16].

TABLE 2: Behavioral practice among hypertensive patients attending St. Paul’s Hospital, Millennium Medical College, Addis Ababa, Ethiopia, 2020 (n = 474).

Variables	Category	Type of hypertension		Total, n (%)
		Controlled, n (%)	Uncontrolled, n (%)	
Alcohol use	Yes	18 (3.8)	188 (39.7)	206 (43.6)
	No	209 (44.1)	59 (12.4)	268 (56.5)
Medication adherence	Adherent	220 (46.43)	74 (15.6)	294 (62.03)
	Not adherent	34 (7.17)	146 (30.8)	180 (37.97)
Smoke cigarette	Yes	3 (0.6)	64 (13.5)	67 (14)
	No	225 (47.5)	183 (44.9)	408 (86)
Chew chat	Yes	3 (0.6)	47 (9.9)	50 (10.5)
	No	224 (47.3)	200 (42.2)	424 (89.5)
Low-salt diet adherence	Adherent	173 (36.5)	25 (5.3)	198 (41.8)
	Nonadherent	54 (11.4)	222 (46.8)	276 (58.2)
Healthy diet adherence	Adherent	88 (18.6)	18 (3.8)	106 (22.4)
	Nonadherent	139 (29.3)	229 (48.3)	368 (77.6)
Physical activity adherence	Adherent	84 (17.7)	46 (9.7)	130 (27.4)
	Nonadherent	143 (30.2)	201 (42.2)	344 (72.6)

TABLE 3: Description of body mass index and the number of antihypertensive drugs taken among adult hypertensive patients at St. Paul’s Hospital, Millennium Medical College, Addis Ababa, Ethiopia, 2020 (n = 474).

Variables	Category	Type of hypertension		Total, n (%)
		Controlled, n (%)	Uncontrolled, n (%)	
BMI	Normal weight	206 (43.7)	113 (23.8)	319 (67.5)
	Over weight	14 (3)	107 (22.6)	121 (25.5)
	Obesity	7 (1.5)	27 (5.7)	34 (7.2)
Number of anti-HTN drugs	Single therapy	107 (22.6)	22 (4.6)	129 (27.2)
	Dual therapy	116 (24.5)	151 (31.9)	267 (56.3)
	≥Triple therapy	4 (0.08)	74 (15.6%)	78 (16.5)

BMI, body mass index; HTN, hypertension.

TABLE 4: Factors associated with uncontrolled hypertension among hypertensive patients attending St. Paul’s Hospital, Millennium Medical College, Addis Ababa, Ethiopia, 2020 (n = 474).

Variables	Category	Type of hypertension		COR (95% CI)	AOR (95% CI)	P
		Controlled, n (%)	Uncontrolled, n (%)			
Level of education	Illiterate	47 (9.9%)	65 (13.7%)	0.384 (0.209–704)*	2.9 (1.244–6.848)	0.011*
	College and above	36 (7.6%)	50 (10.5%)	2.3 (0.758–11.32)	1	
Residence	Rural	92 (19.4%)	69 (14.6%)	0.85 (0.467–5.87)	1	0.004*
	Urban	135 (28.5%)	178 (37.6%)	0.0569 (0.387–0.835)	0.55 (0.366–0.830)	
BMI	Normal weight	206 (90.7%)	113 (45.7%)	0.23 (0.87–2.35)	1	0.016*
	Overweight	14 (6.2%)	107 (43.3%)	0.14 (0.06–0.34)**	0.25 (0.08–0.78)	
	Obese	7 (3%)	27 (11%)	1.98 (0.728–5.39)	1.5 (1.11–5.34)	
Alcohol use	Yes	18 (3.8%)	188 (39.7%)	36.98 (21.1–64.98)	16.7 (8.13–34.36)	0.001**
	No	209 (44.1%)	59 (12.4%)	0.61 (0.49–4.37)	1	
Cigarette smoking	Yes	2 (0.4%)	64 (13.5%)	39.43 (9.5–162.9)*	7.4 (1.211–45.29)	0.003*
	No	225 (47.5%)	183 (44.9%)	4 (0.9–8.39)	1	
Low-salt diet adherence	Adherent	173 (36.5%)	25 (5.3%)	0.21 (0.34–17.07)	1	0.001**
	Nonadherent	54 (11.4%)	222 (46.8%)	28.5 (17.01–47.57)	13.4 (7.36–25.10)	
Physical activity adherent	Adherent	84 (17.7%)	46 (9.7%)	2.3 (0.31–11.87)	1	0.018*
	Nonadherent	143 (30.2%)	201 (42.2%)	0.39 (0.256–0.59)*	0.43 (0.21–0.866)	

\*P < 0.05, \*\*p < 0.001, and 1 reference.

It has been discovered that hypertensive participants who engaged in physical exercise had a lower risk of developing uncontrolled blood pressure than those who

abstained from physical activity. This is in line with research from Sweden, where it was discovered that physical activity was linked to lower systolic and diastolic blood pressure [12],

increased exercise was linked to better hypertension control with an odds ratio of 1.66, and leading a sedentary lifestyle was linked to poorer BP control [17].

It has been discovered that obese individuals were 1.5 times more likely than normal weight patients to have uncontrolled hypertension (AOR = 1.5, 95% CI = (1.11–5.341),  $P = 0.04$ ). This is consistent with research done in Jimma, Ethiopia, which found that individuals who were overweight were twice as likely to have uncontrolled hypertension as those who were normal weight (AOR = 2.241, 95% CI = 1.239–4.053,  $p = 0.008$ ) [2]. In agreement with this, a study done in Zimbabwe revealed that uncontrolled hypertension and obesity were substantially correlated (AOR = 3.28 95% CI = 1.39–7.7) [10]. Numerous variables, including the sympathetic nervous system, the renin-angiotensin-aldosterone system, the natriuretic peptide system, and renal compression from the excessive accumulation of intra-abdominal and retroperitoneal fat have been hypothesized as causes of the elevated blood pressure associated with obesity [18, 19].

## 5. Conclusion

Uncontrolled hypertension is a substantial public health issue. Poor behavioral practices and adherence, such as cigarette smoking, drinking alcohol, lifestyle, low-salt nonadherence, and physical activity nonadherence, have strong associations with uncontrolled hypertension. Therefore, healthcare facilities should be designing a client-centered guideline for follow-up programs and focusing on assisting clients to achieve effective behavioral practice modification towards controlling hypertension. Healthcare providers should also provide health education and awareness of the effect of poor behavioral practices and lifestyle on increasing adherence to hypertension-controlling medical advice. Furthermore, researchers should focus on patient-centered means of adhering to medical advice, and the methods to control hypertension should be assessed in detail.

## Data Availability

The SPSS loaded data used to support the findings of this study are available from the corresponding author upon request.

## Conflicts of Interest

The authors declare that there are no conflicts of interest.

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