Magnitude of Uncontrolled Hypertension and Associated Factors among Adult Hypertensive Patients in Public Hospitals of Central Zone, Tigray, Ethiopia: A Cross-sectional Study 2018

Assefa Iyasu Negash (✉ assie.iyasu@gmail.com)

Aksum University   https://orcid.org/0000-0001-9082-6858

Desta Siyoum

Mekelle University College of Health Sciences

Tsega Hailemariam

Aksum University

Berihu Hailu Kidanu

Aksum University

Gebreamlak Gebremdhin Gebremeskel

Aksum University

Girmay Teklay Weldesamuel

Aksum University

Teklewoini Mariye Zemichael

Aksum University

Kefle Tekulu Gebreslassie

Aksum University

Haftea Hagos

Aksum University

Abstract

Background: - Uncontrolled hypertension is if SBP is ≥140 mm Hg and/or DBP ≥90 mm Hg for general hypertensive population or if SBP ≥130 mm Hg and/or DBP ≥80 mm Hg in patients with established diabetes mellitus or chronic kidney disease based on the average of two or more properly measured, seated, BP readings on each of two or more office visits. The aim of this study was to assess the magnitude of uncontrolled hypertension and associated factors among adult hypertensive patients in public hospitals of central zone, Tigray, Ethiopia, 2018.

Methods:- A hospital based cross sectional study design was used. The study population was all sampled adult hypertensive patients who had follow up in public hospitals of central zone, Tigray and the data collection period was from March 01 to April 30, 2018. About 421 study participants were selected using systematic random sampling. Interviewer administered structured questionnaire, chart review checklist and measurements were used. The collected data was checked for its completeness manually and then entered and cleaned in to epi data version 3.1 and exported to Statistical packages for social science version 22 for analysis. Bivariate and multivariable analyses were done to identify factors of uncontrolled hypertension. Then those variables significant at p<0.25 with the outcome variable in bivariate analysis were selected for multivariable analysis and odds ratio with 95% confidence level was computed and p-value < 0.05 was described as a significant association in multivariable analysis.

Result: - Among 421 respondents about 177(42%) had uncontrolled hypertension. Co-morbidity [AOR=0.36, (0.205, 0.631)], five to ten years duration of medication taken [AOR=0.398, (0.218, 0.725)], side effect of medication [AOR=0.542, (0.339, 0.866)] and medication adherence [AOR=4.092, (2.419, 6.924)] were significantly associated with uncontrolled hypertension.

Conclusion: - In this study the magnitude of uncontrolled hypertension was high. Co-morbidity, antihypertensive medication taken for long duration, side effect of antihypertensive medication and non adherence to antihypertensive medication shows statistical association with uncontrolled hypertension.

Introduction

Hypertension is defined as a persistent systolic blood pressure reading (SBP) of 140 mm Hg or greater and/or a diastolic blood pressure reading (DBP) of 90 mm Hg or greater(1). Uncontrolled hypertension is also defined as if SBP is ≥140 mm Hg and/or DBP ≥90 mm Hg for general hypertensive population or if SBP ≥130 mm Hg and/or DBP ≥80 mm Hg in patients with established diabetes mellitus (DM) or chronic kidney disease (CKD) based on the average of two or more properly measured, seated, BP readings on each of two or more office visits(1). Uncontrolled hypertension signifies blood pressure that is inadequately treated rather than blood pressure that is resistant to treatment(2).

The overall prevalence of hypertension among U.S. adults aged ≥18 years in 2003–2010 was 30.4% or an estimated 66.9 million. Among those with hypertension, an estimated 35.8 million (53.5%) were uncontrolled hypertension (3).

Hypertension is a silent killer disease in both developed and developing nations of the world(4). It is an important worldwide public-health challenge because of its high frequency and risk factor for cerebro vascular, cardiovascular and kidney disease(5).

Uncontrolled hypertension is a major cardiovascular risk factor, if not early controlled, it causes stroke, myocardial infarction, cardiac failure, dementia, renal failure and blindness, causing human suffering and imposing severe financial and service burdens on health systems (6, 7).

Once hypertension develops, it may require lifelong treatment with medicines. Because of the high magnitude, drug treatment can be costly and is a challenge for resource-constrained settings. However, neglecting treatment needs interventions that are even more costly, such as cardiac bypass surgery, carotid artery surgery, renal dialysis and thus draining both individual and government budgets(8). The added burden of diseases as a result of complications from uncontrolled hypertension places additional pressure on the limited health care budget in developing countries. Thus adequate control of hypertension among hypertensive patients is a vast public health importance (9).

In Ethiopia, a few previous studies done to determine the magnitude of hypertension but there is limited data on the uncontrolled rates of it among patients on treatment, particularly in Tigray region little is known and there is no published research article. In addition to this, most of the previous studies were done in developed countries and cannot represent to the developing countries like Ethiopia. Therefore, the purpose of this study is to determine the magnitude of uncontrolled hypertension and to identify the underlying factors associated with uncontrolled hypertension among hypertensive patients in hospitals of central zone, Tigray.

Findings of this study would had such importance for policy makers (MOH, TRHB) while designing strategies to develop effective intervention and for the community including the patients and families to raise awareness towards the importance of blood pressure control and factors that affect the control of blood pressure.

In addition, it would help for health care professionals to give attention on the severity of the disease and to focus on the prevention and control. It will also use for NGOs as a base line data for helping to solve the problem. It can also be used as a base line data for further research who want to undertake similar study in the country.

Methods

Study design & setting

A Hospital based cross sectional study design was conducted. The study was carried out in public hospitals of central zone, which is one of the seven zones of Tigray. Aksum town is the capital city of central zone which is 1015 kms far from north of Addis Ababa.

The study was conducted from November, 2017 to June, 2018.

Sample size determination

The actual sample size for the study was determine using the formula for single population proportion by assuming 5% marginal error, 95% confidence interval (α (alpha) = 0.05) and the magnitude (p-proportion) would taken from a research conducted on Jimma University Teaching and Specialized Hospital, Ethiopia. According to this study, the magnitude of uncontrolled hypertension was 52.7%. The required final sample size with 10% of non-response rate was 421 study subjects.

Sampling technique

There were six hospitals that give chronic care follow up services in central zone of Tigray. Out of these, the four hospitals would be selected using simple random sampling method. The selected hospitals were Aksum St.Marry hospital, Adwa hospital, AbyiAdi hospital and Aksum referral hospital. To obtain the representative sample from each hospital proportional allocation to size would be done and each study participant would be selected using systematic random sampling.

Operational definition

Controlled hypertension: if BP <140/90 mmHg in hypertensive patients and/or <130/80 mm Hg with diabetes or chronic kidney disease (1).

Uncontrolled hypertension: if SBP is ≥140 mm Hg and/or DBP ≥90 mm Hg for general hypertensive population or if SBP ≥130 mm Hg and/or DBP ≥80 mm Hg in patients with established diabetes mellitus (DM) or chronic kidney disease (CKD) based on the average of two or more properly measured, seated, BP readings on each of two or more office visits (1).

Medication adherent: a patient with a MMMAS scores of ≥ 6 (using MMMAS) scale).

Medication non adherent: a patient with a MMMAS scores of < 6 (using MMMAS) scale).

Body Mass Index: calculated as weight in kilograms divided by height in square meters and interpreted as underweight (BMI<18.5), normal weight (18.5 - 24.9), overweight (25.0 - 29.9) and obese (≥30.0) (10).

Physically active: an individual who perform physical exercise for at least 30 minutes per day for at least 3 day per week (11).

Physically inactive: an individual who perform physical exercise for less than 30 minutes per day for less than 3 day per week (11).

Non smoker: respondents who reported to have never smoked or stopped smoking.

Moderation of alcohol consumption: Limit consumption to no more than 2 drinks per day in most men, and to no more than 1 drink per day in women and lighter weight persons. (A drink is 12 oz of beer, 5 oz of wine, 1.5 oz of 80- proof Whiskey and 01 oz is 30 ml of ethanol) (1).

Low salt consumption: to less than 5 g (about 1 teaspoon) per day or less than 2 g sodium per day in adults, to help prevent hypertension, heart disease and stroke (8).

Data collection procedure:

After getting ethical clearance from the institutional review board of Mekelle University, data collection was carried out from March, 01to April 30, 2018 and take a maximum of 30 minutes. The questionnaire was prepared in English and then translated to local language (Tigrigna) and back translated to English to check for consistency. Four degree nurses were recruited as data collectors (one for each hospital) and two master's nurse as supervisor were selected who had an experience of supervision.

Data collection tools:

Structured questionnaire

Interviewer administered structured questionnaire was used to interview the patients. This questionnaire contains four parts. Part-one was collect data about socio demographic characteristic of the respondents. Part two was collect data on disease related factors. Part three and four were also collect data about Life style modifications related to hypertension and medication related factor respectively.

Chart review checklist

It was used to record the necessary information from the patient's medical chart.

Measurements

Weight, height, BMI and blood pressure were measured.

Data quality assurance

Prior to data collection pre-test was conducted on 10 % of the study subjects and training for data collectors and supervisors was given for two days. The collected data was checked every day by supervisors and principal investigator for its completeness. Data was checked again for its completeness before data entry.

Data processing and analysis

After the data collection, the data was entered in to Epidata 3.1 and exported to SPSS version 22 statistical package for analysis. The results of the descriptive statistics were expressed as percentages and frequencies. Associations between independent and dependent variables were analyzed first using bivariate analysis to identify factors associated with the outcome variable. Those variables which were found to have an association with the outcome variable at $P<0.25$ was used in multivariable logistic regression to test for statistical association of independent variable with dependent variable. Odds ratio with 95% confidence level was computed and p-value < 0.05 was described as a significant association in the final multivariable logistic regression analysis. Model fitness was checked by using Hosmer and Lemeshow goodness fit model which was o.519.

Result

Socio-demographic Characteristics

Overall 421 participants were included in this study with response rate of 421 (100%). From the total respondents 201 (48%) were male. The mean age of the respondents was (59.2±(12.6) SD years) with minimum age of 25 and maximum age of 92 years. (*Table 1*)..

Disease related factors

One hundred sixteen (27.6%) were overweight and 24 (5.7%) were obese. among the study participants 98 (23.3%) patients were with co-morbid conditions and from these 57 (58.2%) were diabetic (*Table 2*)..

Adherence with life style modification factors

Among the study participants 266 (63.2 %) had low consumption of salt in diet (*Table2*)..

Medication related factors

More than two third of the study participants were found to be non adherent to their medication according to a self-reported measure of adherence using the eight item MMMAS (*Table3*)..

Magnitude of uncontrolled hypertension

Among the study participants 177(42%) with 95% CI (37.3, 47) had uncontrolled their blood pressure and about 244(58%) had controlled their blood pressure. (*Figure–1*)

Factors associated with uncontrolled hypertension

The association of independent variables with the dependent variable was investigated using both bivariate and multivariable logistic regression technique. The enter method regression was used.

In the multivariable binary logistic regression analysis, only four variables had shown overall significant effect on uncontrolled hypertension at 5% level of significance (*Table 4*)

Discussion

In this study the magnitude of overall uncontrolled hypertension was 177(42%) which is consistent with the study conducted in Chilean in (2012) (40%) (12) and Spain in (2004) (40%) (13).

But this study was lower than with a study conducted in Oman in (2011) (61%) (14), in South Africa in (2012) (58%) (15), in Nigeria in (2013) (65%) (16) and Zimbabwe in (2012) (67.2%) (9). This variation might be due to discrepancies in lifestyle behaviours such as feeding habits that bring hypertension to be difficult to control.

Compared to another study in Ethiopia, the current study was almost lower than in Jimma specialized hospital in (2016) (17), in Gonder hospital in (2012) (18), and in Adama hospital in (2014) (19) which were 52.7%, 53.4% and 56.4% respectively. This variation might be due to environmental factors and this may overestimate the magnitude. Another might be the difference among health care providers while measuring BP.

Adherence to antihypertensive medications had significantly associated with uncontrolled hypertension. This study showed that those who were non adherent to antihypertensive medications were 4.1 times more likely associated to uncontrolled hypertension compared to adherents [AOR = 4.092; 95% CI (2.419, 6.924)]. This study was consistent with a study conducted in Gonder University hospital in (2012) (18) and in Jimma University teaching and specialized hospital in (2016) (17)three and two times more associated to uncontrolled hypertension respectively. This study also supported with a study conducted in Nigeria (2013) (16) and Southern California (2014) (20) five and one times more associated to uncontrolled hypertension respectively. This might be due to patient's ignorance that is when the patients feel good they might think that they completely relived from their problem, might be due to poor counselling related to medication adherence by health care providers and cost of the medications.

Conclusion

The magnitude of uncontrolled hypertension was high among adult hypertensive patients follow up in public hospitals of central zone, Tigray.

Limitations

- There might be social desirability bias, especially on self reported sensitive issues like cigarette smoking status and alcohol intake status, which might result in an overestimate of the number of participants who were abstainers.
- Adherence to antihypertensive medications was measured through self-reported interview and this may cause recall bias and hence, may underestimate medication adherence. There were limited literatures

Abbreviations

BMI: Body Mass Index, BP: Blood Pressure, CI: Confidence Interval, CKD: Chronic Kidney Disease, CSA: Central Statistical Agency, DBP: Diastolic Blood Pressure, DM: Diabetic Mellitus, ETB: Ethiopian Birr, HC: Health Centre, HLT: Hosmer-Lemeshow Test, HTN: Hypertension, JNC: Joint National Committee, MMMAS: Modified Morisky Medication Adherence Scale, MOH: Ministry Of Health, NGO: Non Governmental Organization, NHANESIII: National Health And Nutrition Examination Survey, OPD: Outpatient Department, SPSS: Statistical Package for the Social Science, SBP: Systolic Blood Pressure, TRHB: Tigray Regional Health Bureau, UK: United Kingdom, WHO: World Health Organization.

Declaration

Ethics Approval and Consent to Participate

The study was approved by the institutional research review board of the Mekelle University College of health science. An official permit was also secured to the Tigray regional health bureau. Then a permission and support letter was written to the health office of Aksum, Adwa, AbiAdi town. Respondents have informed the purpose of the study, and then information was collected after obtaining written informed consent from each participant. Information was recorded anonymously and confidentiality was assured throughout the study period.

Consent for Publication

Not applicable

Availability of Data and Materials

All data is available via this manuscript

Conflict Interest

The authors declare that they have no competing interests.

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Tables

Table 1:- socio demographic characteristics of adult hypertensive patients who were attending in public hospitals of central zone, Tigray, Ethiopia, 2018, n=421

Variable	Category	Uncontrolled HTN N (%)	Controlled HTN N (%)	Total N (%)
Age	18-34 years	26(36.1)	46(63.9)	72(17.1)
	35-49 years	81(49.4)	83(50.6)	164(39)
	50-92 years	70(37.8)	115(62.2)	185(43.9)
Sex	Male	78(38.8)	123(61.2)	201(47.7)
	Female	99(45)	121(55)	220(52.3)
Religion	Orthodox	157(43.4)	205(56.6)	362(86)
	Muslim	20(33.9)	39(66.1)	59(14)
Residence	Urban	144(43.5)	187(56.5)	331(78.6)
	Rural	33(36.7)	57(63.3)	90(21.4)
Marital status	Single	8(40)	12(60)	20(4.8)
	Married	126(47)	142(53)	268(63.7)
	Divorced	19(43.2)	25(56.8)	44(10.5)
	Widowed	24(27)	65(73)	89(21.1)
Ethnicity	Amhara	2(33.3)	4(66.7)	6(1.4)
	Tigray	175(42.2)	240(57.8)	415(98.6)
Educational status	No formal edu.	73(40.1)	109(59.9)	182(43.2)
	Primary school	62(46.6)	71(53.4)	133(31.6)
	Secondary school	16(34.8)	30(65.2)	46(10.9)
	College/university	26(43.3)	34(56.7)	60(14.3)
Occupation	House wife	39(50)	39(50)	78(18.5)
	Private business	49(54.4)	41(45.6)	90(21.4)
	Gov't employee	26(49.1)	27(50.9)	53(12.6)
	Farmer	31(32.6)	64(57.4)	95(22.6)
	Unemployed	15(24.2)	47(75.8)	62(14.7)
	Daily laborer	3(30)	7(70)	10(2.4)
	Retired	14(42.4)	19(57.6)	33(7.8)

Table 2:- Description of participant's disease related factors and adherence status on life style modifications among adult hypertensive patients who were attending in public hospitals of central zone, Tigray, Ethiopia, 2018, n=421.

S.No	Variable	Category	Uncontrolled HTN N (%)	Controlled HTN N (%)	Total N (%)
	Frequency of follow up	Monthly	163(41.2)	233(58.5)	396(94.1)
		Every-2 month	14(56)	11(44)	25(5.9)
	Frequency of BP measurement	Weekly	2(50)	2(50)	4(1)
		Every-2 weeks	10(41.7)	14(58.3)	24(5.7)
		Monthly	155(41.7)	217(58.3)	372(88.4)
		Every-2 months	10(47.6)	11(52.4)	21(5)
	Co-morbidity conditions	Yes	61(62.2)	37(37.8)	98(23.3)
		No	116(35.9)	207(64.1)	323(76.7)
	Type of co-morbidity	Diabetic	37(64.9)	20(35.1)	57(58.2)
		Stroke	21(58.3)	15(41.7)	36(36.7)
		Heart failure	2(50)	2(50)	4(4.1)
		Hyperlipidemia	1(100)	0(0)	1(1)
	BMI	Under weight	4(28.6)	10(71.4)	14(3.3)
		Normal weight	104(39)	163(61)	267(63.4)
		Over weight	53(45.7)	63(54.3)	116(27.6)
		Obese	16(66.7)	8(33.3)	24(5.7)

S.No	Variable	Category	Uncontrolled HTN N (%)	Controlled HTN N (%)	Total N (%)
	Cigarette smoking	Yes	4(100)	0(0)	4(1)
		No	173(41.5)	244(58.5)	417(99)
	Alcohol drinking status	Yes	37(39.4)	57(60.6)	94(22.3)
		No	140(42.8)	187(57.2)	327(77.7)
	Physical activity	Active	73(51.8)	68(48.2)	141(33.5)
		Inactive	104(37.1	176(62.9)	280(66.5)
	Salt used in diet	Low consumption	122(45.9)	144(54.1)	266(63.2)
		High consumption	55(35.5)	100(64.5)	155(36.8)

Table 3:- Medication related factors among adult hypertensive patients who were attending in public hospitals of central zone, Tigray, Ethiopia, 2018, n=421.

| S.No.	Variable	Category	Uncontrolled HTN N(%)	Controlled HTN N(%)	Total N(%)
	Duration of medication taken	< 5 years	101(37.1)	171(62.9)	272(64.6)
		5-10 years	55(59.8)	37(40.2)	92(21.9)
		>10 years	21(36.8)	36(63.2)	57(13.5)
	Number of antihypertensive drugs used	Only 1 drug	65(38.9)	102(61.1)	167(39.7)
		2 drugs	75(44.9)	92(55.1)	167(39.7)
		≥ 3 drugs	37(42.5)	50(57.5)	87(20.7)
	Side effect of medications	Yes	101(50.5)	99(49.5)	200(47.5)
		No	76(34.4)	145(65.6)	221(52.5)
	Each type of side effect	Erectile dysfunction	4(57.1)	3(42.9)	7(3.5)
		Head ache	41(54.7)	34(45.3)	75(37.5)
		Weakness	44(47.8)	48(52.2)	92(46)
		Dry mouth	9(52.9)	8(47.1)	17(8.5)
		Others*	3(33.3)	6(66.7)	9(4.5)
	Medication adherence	Adherence	77(64.2%)	43(35.8%)	120(28.5%)
		Non-dherence	100(33.2%)	201(66.8%)	301(71.5%)

*loss of appetite, epigastric pain, abdominal bloating

Table 4:- Bivariate and multivariable analysis of factors among adult hypertensive patients who were attending in public hospitals of central zone, Tigray, Ethiopia, 2018,n=421.

Variable	Category	Uncontrolled HTN N(%)	Controlled HTNN(%)	COR(95%CI)	AOR(95%CI)
Age	18-34 years	26(36.1)	46(63.9)	1	1
	35-49 years	81(49.4)	83(50.6)	0.58(0.3281,1.024)	0.621(0.306,1.261)
	50-92 years	70(37.8)	115(62.2)	0.93(0.528,1.634)	1.554(0.704,3.431)
Residence	Urban	144(43.5)	187(56.5)	1	1
	Rural	33(36.7)	57(63.3)	1.33(0.823,2.151)	1.138(0.512,2.528)
Educational level	No formal edu.	73(40.1)	109(59.9)	1	1
	Primary school	62(46.6)	71(53.4)	0.77(0.488,1.205)	1.168(0.659,2.072)
	Secondary school	16(34.8)	30(65.2)	1.26(0.639,2.467)	1.799(0.757,4.277)
	College/university	26(43.3)	34(56.7)	0.876(0.485,1.581)	1.987(0.656,6.019)
Occupational status	House wife	39(50)	39(50)	1	1
	Private business	49(54.4)	41(45.6)	0.837(0.456,1.536)	0.471(0.216,1.026)
	Gov't employee	26(49.1)	27(50.9)	1.038(0.517,2.087)	0.434(0.141,1.337)
	Farmer	31(32.6)	64(57.4)	2.065(1.114,3.827)	0.668(0.267,1.669)
	Unemployed	15(24.2)	47(75.8)	3.133(1.508,6.511)	1.743(0.734,4.142)
	Daily laborer	3(30)	7(70)	2.33(0.562,9.687)	1.215(0.262,5.63)
	Retired	14(42.4)	19(57.6)	1.357(0.597,3.084)	0.382(0.122,1.191)
Frequency of follow up	Monthly	163(41.2)	233(58.5)	1	1
	Every-2 month	14(56)	11(44)	0.55(0.243,1.241)	0.581(0.230,1.47)
Co-morbidity conditions	Yes	61(62.2)	37(37.8)	0.34(0.213,0.542)	**0.36(0.205,0.631)***
	No	116(35.9)	207(64.1)	1	1
BMI	Under weight	4(28.6)	10(71.4)	1	1
	Normal weight	104(39)	163(61)	0.627(0.192,2.051)	0.809(0.209,3.135)
	Over weight	53(45.7)	63(54.3)	0.475(0.141,1.604)	0.825(0.2,3.393)
	Obese	16(66.7)	8(33.3)	0.2(0.048,0.842)	0.248(0.045,1.348)
Physical activity	Active	73(51.8)	68(48.2)	1	1
	Inactive	104(37.1	176(62.9)	1.817(1.206,2.737)	0.93(0.515,1.678)
Salt used in diet	Low consumption	122(45.9)	144(54.1)	1	1
	High consumption	55(35.5)	100(64.5)	1.54(1.024,2.316)	1.638(0.98,2.737)
Duration of medication taken	< 5 years	101(37.1)	171(62.9)	1	1
	5-10 years	55(59.8)	37(40.2)	0.397(0.245,0.645)	**0.398(0.218,0.725)***
	>10 years	21(36.8)	36(63.2)	1.013(0.56,1.83)	0.889(0.43,1.837)
Side effect of medication	Yes	101(50.5)	99(49.5)	0.514(0.347,0.761)	**0.542(0.339,0.866)***
	No	76(34.4)	145(65.6)	1	1
Medication adherence	Adherent	77(64.2%)	43(35.8%)	1	1
	Non-adherent	100(33.2%)	201(66.8%)	3.599(2.31,5.609)	**4.092(2.419,6.924)***

*p-value<0.05-statistically significant. HTN- hypertension. BMI- body mass index.

Figures
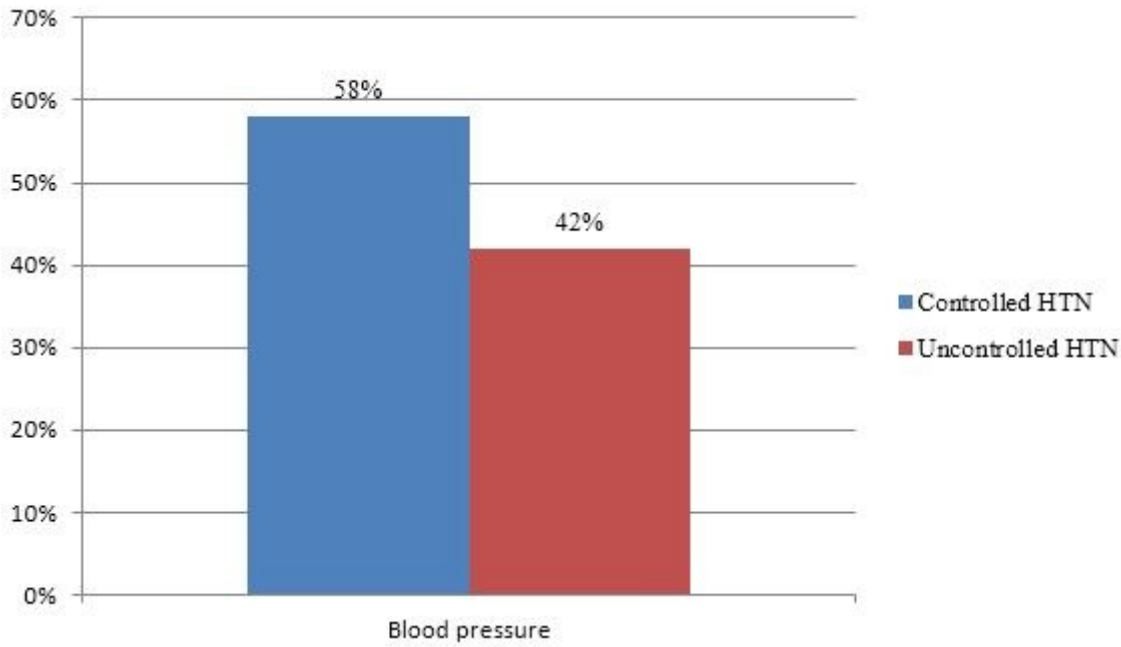
Figure 1

Magnitude of uncontrolled hypertension among adult hypertensive patients who were attending in public hospitals of central zone, Tigray, Ethiopia, 2018, n=421.