



## ORIGINAL RESEARCH

# Uncontrolled Hypertension and Associated Factors among Hypertensive Adults in Bale Zone Public Hospitals, Ethiopia

Feyissa Lemessa<sup>1\*</sup> and Miressa Lamessa<sup>2</sup>

<sup>1</sup>Department of Nursing, St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia

<sup>2</sup>Department of Emergency and Critical Care, St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia

\*Corresponding author: Feyissa Lemessa Jinfessa, Department of Nursing, St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia, Tel : +251-920-405-878



## Abstract

**Background:** Although blood pressure control has tremendous public health benefit, and has effective treatments, the global rate of uncontrolled blood pressure remains high. In sub-Saharan Africa including Ethiopia uncontrolled blood pressure resulted in a significant morbidity and mortality. Unfortunately, uncontrolled hypertension among adult hypertensive patients remains unclear and has been inadequately studied in Ethiopia, in the study area in particular.

**Objective of the study:** This study assessed uncontrolled hypertension and associated factors among adult hypertensive patients on follow up clinics in Bale Zone Public Hospitals, Ethiopia, 2017.

**Methods:** Institution based quantitative cross-sectional study was conducted at the hypertensive clinics of Bale Zone Public Hospitals from October 2017 to May 2018.

A total of 323 hypertensive patients were selected using systematic sampling technique. Data were collected using structured questionnaire through face-to-face exit interview and chart review. Data was analyzed using statistical package for the social sciences (SPSS) version 20.0 software. The bivariate and multivariable analysis was done to identify factors of uncontrolled hypertension.

**Results:** More than half, 56.7%, of the patients had uncontrolled hypertension. One hundred eighty-three (61.0%), were reported as adherent to hypertension medication protocols. One hundred eleven, 37.0% were not following a low-salt diet. Lack of awareness of hypertension-related complications (AOR = 2.04 (1.26-3.59),  $p = 0.003$ ), overweight (AOR = 2.3 (1.19-4.2),  $p = 0.007$ ), middle age (AOR = 6.89, 95% CI = 1.9-17.5,  $p = 0.008$ ), and old age (AOR = 7.94, 95% CI = 2.5-19.12,  $p = 0.001$ ) were significant predictors of uncontrolled hypertension.

**Conclusion:** The prevalence of uncontrolled hypertension was high at the study area among patients with hypertension. Being overweight and lack of awareness on Hypertension i.e. poor knowledge on hypertension management can result in hypertension-related complications. Hence, Continuous health education on lifestyle practices and hypertension-related complications in each follow-up visit highly recommended.

## Keywords

Uncontrolled hypertension, Self-care practice, Bale, Ethiopia

## Introduction

Hypertension is a condition in which blood pressure is abnormally high and defined as the a systolic blood pressure (SBP) is equal to or above 140 mmHg and/or diastolic blood pressure (DBP) equal to or above 90 mmHg based on the average of equal or above two accurate blood pressure measurements taken at least in two visits [1,2].

It is considered uncontrolled if systolic SBP  $\geq 140$  mmHg and/or DBP  $\geq 90$  mmHg for general hypertensive population, or SBP  $\geq 130$  mmHg and/or DBP  $\geq 80$  mmHg in patients with established diabetes mellitus (DM) or chronic kidney disease (CKD) [3].

Hypertension can be prevented and controlled by non-drug and drug treatment. The non-drug treatment includes maintaining normal body weight, eating a diet rich in fruits, vegetables, and low fat dairy products, reducing dietary sodium, alcohol and smoking restriction,

and involving in physical activity. The other is drug treatment of hypertension which benefits to lower blood pressure (BP) and has different classes. These include; thiazide-type diuretics, angiotensin converting enzyme inhibitor (ACEI), angiotensin ii receptor blockers (ARBs), and Calcium Channel Blockers (CCBs) and other drug classes [4].

In addition adherence to these treatment helps maximum benefit in controlling BP because failure hinders control of high blood pressure, compromises the efforts of the health care system, policy makers and health care professionals and causes medical and psychological complications of the disease, reduces patients' quality of life, wastes health care resources and erodes public confidence in health systems [5].

Globally, hypertension (HTN) is the leading cause of cardiovascular diseases (CVD) and deaths, and accounts for about 7.5 million deaths per year and 12.8% of the total of all deaths [6].

From 17.5 million CVD related deaths in 2012, hypertension accounted 9.4 million. Majority of hypertension related deaths were due to its complication (45% heart disease and 51% due to stroke) [7].

Most morbidity and mortalities are due to poor blood pressure control. Blood pressure levels showed a positive and continuous relation to the risk for stroke and coronary heart disease. Hypertension doubles the risk of mortality of stroke, triples the risk of coronary artery disease and accelerates the progression of diabetic complications. But, the natural course of hypertension can be modified with the use of effective and inexpensive medications, and achieving blood pressure control reduces all hypertension related complications [6].

Prevalence rates in all countries are broadly comparable to those of developed countries (52.9%; range 32.3% in India to 77.9% in South Africa) [8]. Its incidence has doubled in the last half a decade in all segments of population. Globally, from the people with hypertension, only 57%, 40.6% and 13.2% know their status, receive antihypertensive drug treatment and achieve controlled blood pressure below 140/90 mmHg respectively. This situation is high in the middle and low income countries where 80% of the burden occurs. In addition; African Union Ministers of Health conference report on non-communicable diseases indicated as HTN prevalence increases in Africa substantially than western countries. Sub-saharan africa (SSA) including Ethiopia, adult hypertensive population is predicted to be 150 million by 2025 [9].

In Ethiopia, the estimated prevalence of hypertension from the recent two studies ranges from 17% to 19.6% [3,10] while uncontrolled hypertension among adult hypertensive patients ranged from 37% in Gondar, Addis Ababa and Tigray to 53% in Jimma [3,11]. Therefore, adequate control of blood pressure avoids 10 mil-

lion premature death related to uncontrolled HTN in the next ten years [10].

Although hypertension is a preventable and modifiable risk factor of CVD, the prevention and control of hypertension has not yet received due attention in many developing countries where almost three-quarters of people with hypertension (639 million people) are living. People have a very low awareness about hypertension and BP control [10].

Even though, effective treatments are available to aid the control of blood pressure, the global rate of uncontrolled blood pressure remains high. In both high and low income countries, less than 27% and 10% respectively of hypertensive patients have achieved their target blood pressure [12].

A number of factors contributing to uncontrolled BP and made the management of hypertension more challenging. Among these factors being males [13-15], increasing patient age, living in rural and suburban areas, low educational level, family history of hypertension, smoking, Khat chewing, alcohol consumption, excessive salt consumption, lack of physical activity, overweight, obese and diabetes [3,15,16], increased number of antihypertensive medications prescribed, non-adherence to medications and depression [14,17,18], co-morbidity like diabetes mellitus [19], tendency for more consumption of salty foods and failing to compliance therapy [20], a history of myocardial infarction and being divorced/widowed, unemployed status, and consumption of western-type diet [6], higher medication cost [21,22].

Since control of blood pressure has tremendous public health benefit, attention has been given to improve adherence to hypertension treatment regimens. But, poor blood pressure control remains a common problem that contributes to significant morbidity and mortality, particularly in low and middle income countries including sub-Saharan Africa where management is limited and are experiencing the most devastating challenge [23]. Unfortunately, the reasons for uncontrolled hypertension remain unclear in low income countries and have been insufficiently studied [12]. The problem is worse in Ethiopia where patients have low level screening and follow up. On the other side, uncontrolled blood pressure affects the limited national health care budget of the country [3].

In addition; the ministry of health has national multi-sectoral strategic plan with various sectors to tackle the top prioritized non-communicable disease like hypertension, diabetes, cancer, asthma, etc [24]. To achieve such plan data related to uncontrolled blood pressure and factors associated is necessary. But limited studies have been conducted regarding rate of uncontrolled blood pressure in Ethiopia so far in the study area in particular. Inadequate information regarding the rate and risk factors of uncontrolled hypertension affects the

management of hypertension and care of hypertensive patients in the country. Therefore, this study will assess the uncontrolled hypertension and associated factors among adult hypertensive patients on follow up clinics in Bale Zone Public Hospitals, Ethiopia.

## Material and Methods

### Study area and period

The study was conducted in Public Hospitals of Bale Zone. This Zone has around 725 health facilities (4 hospitals, 84 functional health centers, 351 functional health post, 182 private clinic, 1 NGO clinic, 4 other public clinic, 95 pharmacy/drug shop, 1 NGO drug shop and 4 medical drug store) [25]. The four hospitals are Goba Referral Hospital (the only referral and teaching hospital in Bale Zone, Ethiopia), Robe Hospital, Delomenna Hospital and Ginnir Hospital. The hospitals have different departments like internal medicine, surgery, pediatrics, and gynecology/obstetrics. In addition, the hospitals have follow up clinic for the major chronic illnesses. The hypertension follow up clinic is one in which treatment and follow up for hypertensive individuals is taking place. There were around 2000 (400 = Robe Hospital, 300 Ginnir Hospital, 1000 = Goba referral Hospital and 300 = Delomenna Hospital) patients taking antihypertensive treatment at the chronic illness follow-up care unit according to data registered in 2017 prior to data collection period, Patient's clinical profile is kept recorded in their charts. Patients are treated based on international guidelines otherwise there is no local guideline to comply with.

The study was conducted from October 2018 to March 2019.

### Study design

Institution based cross-sectional study design was employed among hypertensive on follow up and presenting to hypertension follows up clinic of Bale Zone Public Hospitals.

### Study population

**Source population:** The source populations were all adult patients with hypertension follows up clinic of Bale Zone Public Hospitals in the study period.

**Study population:** Study population was all selected adult patients with hypertension who will visit hypertension follows up clinic of Bale Zone Public Hospitals in the study period.

### Inclusion and exclusion criteria

**Inclusion criteria:** Respondents were eligible if they are  $\geq 18$  years, on pharmacologic therapy and having followed up in the hospital for at least six months.

**Exclusion criteria:** Participants were excluded if they have missing BP measurement in two previous visits,

too ill to be interviewed, and pregnant women because of the effect of physiology of pregnancy on BP.

### Study unit

The study unit was individual patients with hypertension.

### Sample size

The sample size was calculated using a formula for estimation of a single population by considering 52.7% prevalence of uncontrolled hypertension from a study conducted at Jimma University specialized teaching and referral Hospital [3], 95% confidence level and margin of error of 5%. Since the source population is less than 10,000 correction formula is applied Correction formula and by adding 10% non-response rate, the final sample size become 356 hypertensive patients.

### Sampling technique and procedures

Systematic random sampling technique was used to select 356 study participants. The sample size was distributed according to the Hospitals' patient flow. Accordingly, Robe Hospital = 71 patients, Ginnir Hospital, = 54 patients, Goba referral Hospital = 178 patients and Delomenna = 53 patients. Sampling interval was six. A random number was picked as the starting point.

### Study variables

#### Dependent variables:

- Uncontrolled hypertension

#### Independent variables

- Socio-demographic information (age, sex, marital status, residence, level of education, occupation and household monthly income).
- Family history of HTN
- Self-care practice (medication adherence, low-salt diet, physical activity, Smoking, weight management, alcohol consumption, khat chewing)
- Patients clinical information:
  - ✓ Duration of HTN
  - ✓ Co-morbidity (depression status, DM, stroke, MI, chronic kidney disease)
  - ✓ Number and types of antihypertensive medications
  - ✓ Physical measurements (obesity status which was calculate from patients' Weight And Height)

### Data collection instruments and Data collection procedures

Data was collected through interviewing hypertensive patients; review of their medical records and by taking physical measurements.

**Data collection instruments:** Structured and interviewer administered questionnaire adapted from relevant literature was used to collect the data. The data collection tool was assessed respondent's socio-demographic information (age, sex, marital status, residence, level of education, occupation and household monthly income), family history of HTN, awareness of HTN, Number and types of anti-hypertensive medication, knowledge on self-care, co morbidity (depression status, DM, stroke, chronic kidney disease etc.), clinical conditions, khat chewing. The patient chart was reviewed and physical measurements (height, weight, body mass index) were taken.

To measure self-care practice, hypertension self-care activities scale effect (H-Scale) was used which contains medication adherence (3 items), low-salt diet (12 items), physical activity (2 items), smoking (2 items), weight management (10 items), alcohol (3 items) [26]. All self-care domains had acceptable reliability in previous study in Ethiopia [3]. To see whether the items in each subscale measure the same thing or not, principal component analysis was conducted.

The patient health questionnaire (PHQ-9) was used to measure the severity of depressive symptoms. The PHQ-9 is based on the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV), and has 9 items scored from 0 (not at all) to 3 (nearly every day). Participants were asked whether they have experienced any symptom(s) over the past 2 weeks. Total scores range from 0 to 27. The PHQ-9 has an acceptable reliability with alpha coefficient value of 0.83 in previous study [3].

Client's chart was reviewed using data extraction checklist to retrieve medical information (drug information, co morbid cases, and the representative BP, which was the BP reading from the most recent, visit [last three consecutive appointments including data collection day, duration of hypertension]).

A physical measurement such as height and weight was measured. Body weight was weighed without heavy clothing to the nearest 0.1 kg using a digital scale and height was measured without shoes using a mounted stadiometer to the nearest 0.1 cm in the standing position. Body mass index was calculated as a ratio of weight in kilogram to height squared (in meter square), and participants was categorized according to world health organization criteria; If 25.0-29.9 kg/m<sup>2</sup> overweight and (< 18.5 kg/m<sup>2</sup> under-weight. If BMI will greater than or equal to 30.0 kg/m<sup>2</sup> patients was classified as class 1 (30.0-34.9 kg/m<sup>2</sup>), class 2 (35.0-39.9 kg/m<sup>2</sup>) and class 3 (> 40 kg/m<sup>2</sup>) obesity. Current blood pressure was measured after patients will rest for at least five minutes with arm at the level of the heart and the feet together. An appropriate cuff size was used depending on the size of participant's arm.

The tool was modified to fit the study population.

Face and content validity was evaluated, before and after pretest. Pretested was done on 5% respondents in Dodola Hospital which is the nearest hospital to the study area. This was done in order to assess the suitability of the contents, clarity, sequence and flow of the questionnaire. The questionnaire will then be refined for final use.

All questionnaire was prepared in English language and then translated to Afaan Oromoo and Amharic (local language and was re-translated back to English to check for any inconsistencies.

**Data collection procedures:** The questionnaire was administered by 4 BSc nurses who were supervised by 2 MSc supervisors. Before going to the field, the data collectors were taken through a two days training and practical demonstrations on interview techniques and physical measurement procedure. After allocating the calculated sample sizes for each Hospital proportionally; data collection was started. Registration numbers of the patients who was on follow-up and eligible from each hospital was taken. An exit interview was done. The first patient was chosen by lottery method, and systematic random sampling technique was used in the subsequent patients every k<sup>th</sup> (every six patients) value interval until the calculated sample was achieved.

### Data processing and analysis procedures

Data was entered into EPI Data version 3.1 and exported to version 21 of statistical package for the social sciences (SPSS) for analysis. The entered data was checked for completeness and consistency before analysis was done. Descriptive statistics (frequencies, percentages, mean values, and standard deviations [SDs]) was calculated for demographic and health characteristics and to assess participants' BP control status. Percentages (frequency) for categorical variables or means with SDs for continuous variables (age, years of treatment, SBP, and DBP), p-values ( $p < 0.25$ ), and crude odds ratios (COR), and 95% confidence intervals (CIs) was used to present results of the bivariate logistic regression analysis. All predictor variables that had a significant association in bivariate analysis with p-value < 0.25 was entered into multivariable logistic regression model to assess the association between dependent and independent variables. Multivariable logistic regression model with likelihood forward method was performed to evaluate predictors of uncontrolled hypertension. Statistical significance was defined at a probability level of 0.05. Hosmer-Lemes how goodness-of-fit statistic was used to check model fitness. Finally, the result was summarized and presented in the form of texts, tables and graphs.

### Data quality management

The quality of data was assured by pre-testing the questionnaire on 5% of the actual sample size outside



of the study area in Dodola Hospital two weeks before actual data collection, and appropriate modifications of questionnaire was done based on the result of the pre-test, proper training of the data collectors on the data collection procedure was given, completeness of the data was checked on field level. Repeated revisits were done to get participants in case of absence. To avoid data entry error, double data entry through Epi-Data version 3.1 was used Proper categorization and coding of data was done during data cleaning phases.

### Dissemination Plan

The final report of the paper will be presented to goba referral hospital (GRH), madda walabu university (MWU). Again the study findings will disseminate to Bale zone Hospitals, and Bale Zone health office. And finally, attempts will make to publish the findings in reputable scientific journals.

### Ethical Consideration

Before the actual work, the ethical clearance and approval was obtained from the ethical review committee of Goba Referral Hospital, Madda Walabu Uni-

versity. Permission was obtained from each Hospital. Oral informed consent was taken from each participant before commencement of the interviews and measurements. The purpose of the research, potential benefits and risks to be incurred was explained to the study participants. Participation in this study was voluntary and participants were free to withdraw at any stage of the study without any repercussions. Confidentiality was maintained during data collection, storage and analysis and only the principal investigator will have access to the questionnaires and data. To assure anonymity the names and address of study participants was not be written on the questionnaire; instead unique codes was used.

### Results

Out of 323 hypertensive patients planned to be included in the study, 300 were interviewed, twenty-three refused to participate because of lack of time to complete the interview making a response rate of 95.6%.

#### Socio-demographic characteristics of the respondents

The mean age of the participants was 48 with standard deviation of 14 years and around half (46.7%) were females. Two hundred sixteen (65.5%) of the participants were married. Regarding their occupational status about 33% were farmers while about 27% were housewives. About a quarter (24.8%) were housewives, Out of all participants 46.3% were illiterate. The majority of the respondents, 70%, were rural dwellers (Table 1).

#### Prevalence of uncontrolled hypertension

The three consecutive follow-up averages SBP of the patients were 127 with SD of 17.73 mmHg. The mean DBP of the patients was 78.02 with SD of 18 mmHg. The three consecutive follow-up average BP of the patients revealed that the overall prevalence of uncontrolled hypertension was 170 (56.7%) and prevalence of controlled hypertension 130 (43.3%) (Figure 1).

#### Knowledge status on self-care behaviors and awareness of hypertension-related complication

This study found that 100 (52.4%) of patients with uncontrolled hypertension had adequate knowledge on self-care whilst about 56% of patients with controlled hypertension had adequate knowledge of self-care. Majority, 57% of patients with uncontrolled hyperten-

**Table 1:** Socio-demographic characteristics of hypertensive patients who were attending hospitals in Bale zone southwest Ethiopia, 2019.

Variables	Responses	Number	Percent
Sex	Male	160	53.3
	Female	140	46.7
Marital status	Single	5	1.7
	Married	280	93.3
	Divorced	10	3.3
	Widowed	5	1.7
Education level	Illiterate	139	46.3
	Literate	161	53.7
Occupation	Government employee	40	13.3
	Farmers	100	33.3
	Housewife	80	26.7
	Daily laborer	80	26.7
Residence	Urban	90	30.0
	Rural	210	70.0
Family income (Ethiopian Birr)	< = 500	80	26.7
	501-2000	213	71.0
	> 2000	7	2.3

**Table 2:** Knowledge status on self-care behaviors and awareness of hypertension-related complication among adult hypertensive patients who were attending hospitals in Bale zone southwest Ethiopia, 2019.

Variable	Category	Uncontrolled	Controlled
Knowledge on self-care	Adequate knowledge	100 (52.4)	61 (55.9)
	Inadequate knowledge	91 (47.6)	48 (44.1)
Awareness on HTN complication	Yes	85 (42.9)	59 (57.8)
	No	113 (57.1)	43 (42.2)

sion had no awareness on Hypertension complication whilst about 42% of patient with controlled hypertension had no awareness on Hypertension complication (Table 2).

### Adherence with lifestyle behaviors

More than half of the participants, 183 (61.0%), were reported as adherent to hypertension medication protocols. One hundred eleven, 37.0% were not following a low-salt diet and all most all, 295 (98.3%) of the participants were nonsmokers. One seventy-nine, 59.7% of the participants were not adhered to weight management practices while the rest were reported as adhered to weight management practice. The majority of the patients, 209 (69.7%), have got their BP measured two or more times in a month whilst the rest were less than two times (Table 3).

### Presence of co-morbidity

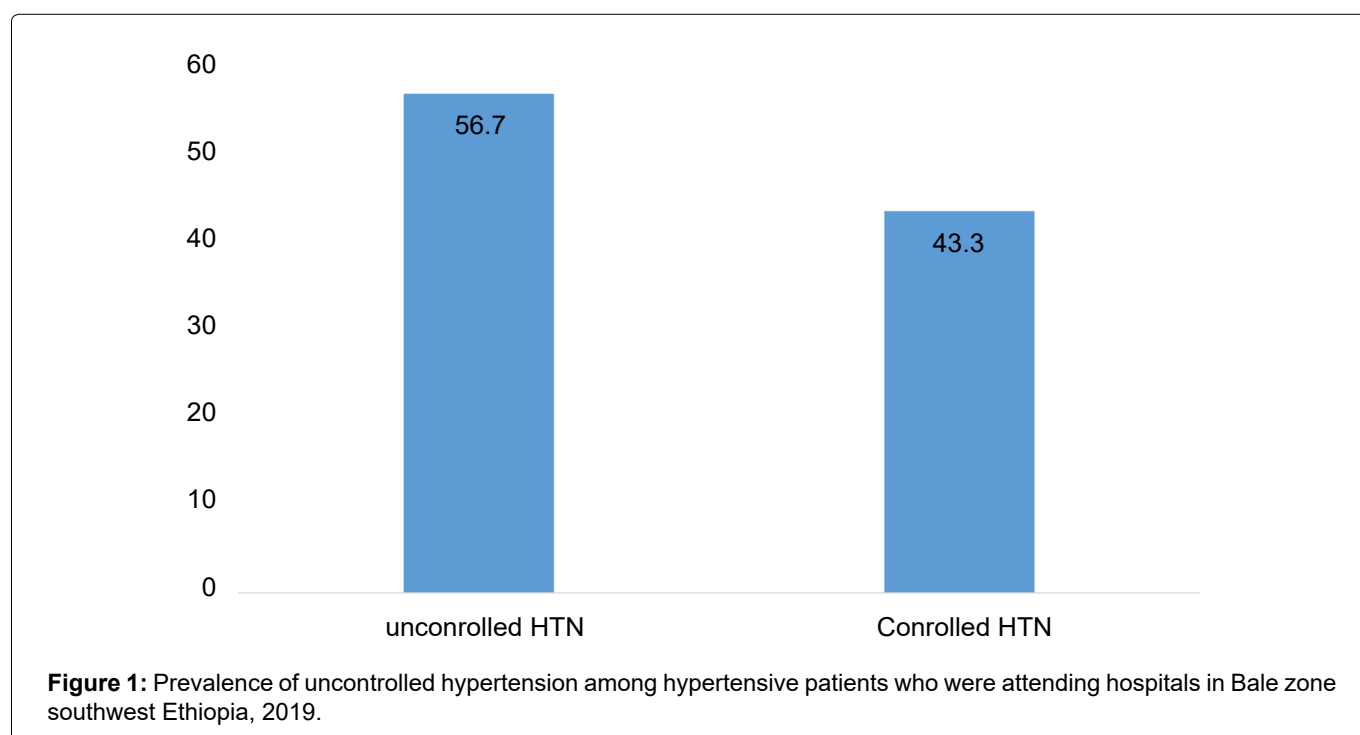
Co morbidity was checked after clinical data review from the patient card, and evidences of co morbidity, like DM, heart failure, or chronic renal disease, were not noted among the 197 (65.6%) of the study participants.

### Biological characteristics (overweight, obesity) and number of regimen

BMI was calculated after conducting physical measurements such as weight and height. Majority of participants, 203 (67.7%), had normal body mass index, and regarding medications, 108 (36.0%) were on dual antihypertensive therapy (Table 4).

### Factors associated with uncontrolled hypertension

From the socio-demographic characteristics age was



**Table 3:** Participants' adherence status on self-care behaviors Participants' adherence status on self-care behaviors (prevalence rates on self-care activity) among adult hypertensive who were attending hospitals in Bale zone southwest Ethiopia, 2019.

Variables	Category	Number	Percent
Medication adherence	Yes	183	61.0
	No	117	39.0
Low salt diet adherence	Yes	111	37.0
	No	189	63.0
Smoking	No	295	98.3
	Yes	5	1.7
Weight management adherence	Yes	121	40.3
	No	179	59.7
Khat use	Yes	147	49.0
	No	153	51.0
BP check up	Less than 2	91	30.3
	Two and above	209	69.7

significantly associated, and patients found in the age range of 35-49 and  $\geq 50$  are seven times and eight times more likely to have uncontrolled hypertension compared to 24-34 aged patients, respectively ([AOR = 6.89, 95% CI = 1.86-19.493,  $p = 0.030$ ] and [AOR = 7.94, 95% CI = 2.52-19.19,  $p = 0.001$ ]). On the other hand, overweight patients were two times more likely to have uncontrolled hypertension when compared to normal-weight patients (AOR = 2.241, 95% CI = 1.239-4.053,  $p = 0.008$ ) (Table 5).

## Discussion

This study can suggest uncontrolled hypertension as a devastating public health problem. More than half of the patients having treatment, 52.4%, had poorly controlled BP indicating that uncontrolled hypertension as a devastating public health problem. Finding from the current study is almost consistent with studies done at Gondar University Hospital, in northwest Ethiopia which reported that the prevalence of uncontrolled hypertension was 53.4%. However, it is lower compared to study done in Singapore, and two different health institutions

in Nigeria, which was reported as 62.3%, 62.3%, and 75.8% respectively [27,28].

This difference might be due to difference in study population (community vs hospital-based study) in Singapore and the difference of urbanization, which is more in Nigeria than Ethiopia and mainly because of discrepancies in environmental factors and lifestyle behaviors such as feeding habits and sedentary lifestyles that bring hypertension to be difficult to control [29].

Compared to another study in Ethiopia, the current study is lower than Tikur Anbessa Hospital, the capital city of Ethiopia, which was reported as 59.9%. The variation could be because of that the average of 1-year BP measurements was taken in Tikur Anbessa hospital as compared to an average of three consecutive follow-up BP measurements in this study [29].

The majority of the findings of this study are consistent with the findings of other similar works in different countries but some variables have not yet shown a significant association. While dealing with socioeconomic factors associated with uncontrolled hypertension, the BP control became difficult among those who were at an age range of 35-49 and  $\geq 50$  as compared to 18-34-aged patients [AOR = 6.89 (1.9-17.49)  $p = 0.03$ ], and [AOR = 7.94 (2.5-19.12),  $p = 0.001$ ], respectively [30].

Similarly, this study also revealed that BP control is poor in overweight patients (AOR = 2.3 (1.19-4.2),  $p = 0.007$ ), as due to weight gain there is increased after load on the heart or increase in peripheral vascular resistance, which increases cholesterol and triglyceride levels, and decreases HDL levels in the blood, and thereby exacerbate poor BP control [31].

The respondents' awareness of hypertension-related complication revealed that participants who did

**Table 4:** Description of participants by body mass index, and number of antihypertensive drugs taken among adult hypertensive who were attending hospitals in Bale zone southwest Ethiopia, 2019.

Variables	Category	Number	Percent
BMI	Normal	203	67.7
	Over	56	18.7
	Obese	41	13.7
Number of drugs	One drug only	29	9.7
	Two drugs	163	54.3
	Three and above	108	36.0

**Table 5:** Multivariate analysis of factors among adult hypertensive patients at public hospitals of Bale Zone southeast Ethiopia, 2019.

Variables	Categories	AOR(95% CI)	P- VALUE
Age	24-34	1	
	35-49	6.89 (1.86-17.49)	0.030
	50 and Above	7.94 (2.52-19.19)	0.001
Body mass index	Normal	1	
	Overweight	2.3 (1.19-4.2)	0.007
	Obese	0.65 (0.29-1.87)	0.049
Medication adherence	Adherent	1	
	Not adherent	1.59 (1.03-2.59)	0.024
Smoking status	Not smoker	1	
	Smoker	3.8 (1.05-14.34)	0.004
Awareness of HTN complication	Yes aware		
	Not aware	2.04 (1.26-3.59)	0.003
Number of therapy	Single	1	
	Dual	1.34 (0.58-3.09)	0.25
	Triple	1.98 (0.86-2.57)	0.03

not know at least two complications were more likely to have uncontrolled hypertension than those who knew at least two complications (AOR = 2.04 (1.26-3.59),  $p = 0.003$ ) and this idea was also speculated in Algeria [32].

This might be because having awareness of short- and long-term complications of hypertension leads to fear, frequent visit of health setup, increased health-seeking behavior, and better BP control. Non adherence to smoking abstinence has shown significant association with uncontrolled BP (AOR = 1.59 (1.03-2.59),  $p = 0.024$ ), and this finding is supported by studies in Spain and Singapore [27,33].

The possible justification has been previously described in detail as smoking leads to enhancement of sympathetic activity, which increases cardiac muscle oxygen demand through escalation of BP, heart rate, and contraction of myocardium. Moreover, prolonged smoking and even after quitting, it makes arteries to be rigid and tough, which leads to sustained high BP [34].

## Conclusion

The prevalence of uncontrolled hypertension was high, and more than half of the adult hypertensive patients had poor BP control at public hospitals of Bale Zone southeast Ethiopia. The reasons for the suboptimal BP control were poor knowledge of hypertension-related complications, non-adherence to smoking abstinence, overweight, and middle and older age. Continuous health education on lifestyle practices and hypertension related complications in each follow-up visit through nurses, physicians, and pharmacists are very essential to avert the problem.

## Acknowledgments

First and for most we want to thank almighty GOD who gives us strength and health, and for everything he has done for us.

Next we would like to forward our thanks to Goba referral Hospital, College of Medicine and Health Sciences, Madda Walabu University which prepared this proposal call and invited us to participate. We would also like to thank Bale zone public Hospitals offices for necessary preliminary information delivery.

Finally, our appreciation goes to our friends who supported us in the preparation of this proposal one in the other way.

## Disclosure

The author reports no conflicts of interest in this work.

## References

- Suzanne CS, Brenda GB (2010) Text book of medical- surgical nursing. Wolters Kluwer Health/Lippincott Williams & Wilkins.
- Getachew T, Tadesse A, Yoseph M, Zenebe A, Abere B, et al. (2006) Internal medicine: Lecture note for health officers.
- Tesfaye B, Haile D, Lake B, Belachew T, Tesfaye T, et al. (2017) Uncontrolled hypertension and associated factors among adult hypertensive patients on follow-up at jimma university teaching and specialized hospital: Cross-sectional study. *Research Reports in Clinical Cardiology* 8: 21-29.
- Amare F (2016) Blood Pressure control and Associated factors among hypertensive patients attending health centers of addis ababa firehiwot amare. A thesis submitted to the department of pharmacology and clinical pharmacy, school of pharmacy, college of health sciences.
- Abere DA, Getahun AA, Solomon MW/Y, Zelalem BM (2012) Adherence to antihypertensive treatment and associated factors among patients on follow up at University of Gondar Hospital, Northwest Ethiopia. *BMC Public Health*.
- Adeniyi OV, Yogeswaran P, Longo-mbenza B, Daniel T (2016) Uncontrolled hypertension and its determinants in patients with concomitant type 2 diabetes mellitus ( T2DM ) in rural south africa. *PLoS One* 11: e0150033.
- IFPMA (2016) Hypertension: Putting the pressure on the silent killer.
- Lloyd-Sherlock P, Beard J, Minicuci N, Ebrahim S, Chatterji S (2014) Hypertension among older adults in low- and middle-income countries : prevalence , awareness and control. *Int J Epidemiol* 43: 116-128.
- van de Vijver S, Akinyi H, Oti S, Olajide A, Agyemang C, et al. (2013) Status report on hypertension in Africa - Consultative review for the 6th Session of the african union conference of ministers of health on NCD's. *Pan Afr Med J* 16: 1-17.
- Kibret KT, Mesfin YM (2015) Prevalence of hypertension in Ethiopia: A systematic meta-analysis. *Public Health Reviews*.
- Abdu O, Diro E, Balcha A, Abdulkadir, Ayanaw D, et al. (2017) Blood pressure control among hypertensive patients in university of gondar hospital, northwest Ethiopia: A cross sectional study. *Clinical Medicine Research* 6: 99-105.
- Menanga A, Edie S, Nkoke C, Boombhi J, Jingi Musa A, et al. (2016) Factors associated with blood pressure control amongst adults with hypertension in Yaounde, Cameroon: A cross-sectional study. *Cardiovasc Diagn Ther* 6: 439-445.
- Cordero A, Bertomeu-Martinez V, Mazon P, Facila L, Bertomeu-Gonzalez V, et al. (2011) Factors associated with uncontrolled hypertension in patients with and without cardiovascular disease. *Rev Esp Cardiol* 64: 587-593.
- Kubo MN, Kayima JK, Were AJ, McLigeyo SO, Ogola EN (2015) Factors associated with uncontrolled hypertension among renal transplant recipients attending nephrology clinics in Nairobi, Kenya. *J Transplant* 2015: 746563.
- Babiker FA, Elkhaila LA, Moukhyer ME (2013) Awareness of hypertension and factors associated with uncontrolled hypertension in Sudanese adults. *Cardiovasc J Afr* 24: 208-212.
- Dachun X, Wei C, Xiankai Li, Yi Zhang, Xin Li, et al. (2013) Factors associated with blood pressure control in hypertensive patients with coronary heart disease: Evidence from the chinese cholesterol education program. *PLoS One* 8: e63135.
- Dina TE, Mitchell AP, Robert LD, Raoul JB (2014) A large cohort study evaluating risk factors associated with uncontrolled hypertension. *J Clin Hypertens (Greenwich)* 16: 149-154.



18. Vincent B, Adebowale DA, Aina OO, Francis A, Chibuike EN, et al. (2015) Factors associated with medication non-adherence among hypertensives in ghana and nigeria. *Int J Hypertens* 2015: 205716.
19. Degli E, Di MM, Sturani A, Russo P, Dradi C, et al. (2004) Risk factors for uncontrolled hypertension in Italy. *J Hum Hypertens* 18.
20. Khosravi A, Pourheidar B, Roohafza H, Moezzi M, Mousavi M, et al. (2014) Evaluating factors associated with uncontrolled hypertension: Isfahan cohort study, Iran. *ARYA Atheroscler* 10: 311-318.
21. Maginga J, Guerrero M, Koh E, Holm Hansen C, Sheda-fa R, et al. (2016) Hypertension control and its correlates among adults attending a hypertension clinic in tanzania. *J Clin Hypertens (Greenwich)* 18: 207-216.
22. Wang Y, Kong D-G, Ma L-L, Wang L-X (2013) Patient related factors for optimal blood pressure control in patients with hypertension. *African Health Sciences* 13: 579-583.
23. Bosworth HB, Dudley T, Olsen MK, Voils CI, Powers B, et al. (2006) Racial differences in blood pressure control: Potential explanatory factors. *Am J Med*.
24. Health EM (2015) HSTP: Health sector transformation plan.
25. Office B zone health (2014) Bale zone health office report.
26. Warren-Findlow J, Basalik DW, Dulin M, Tapp H, Kuhn L (2013) Preliminary validation of the hypertension self-care activity level effects (H-SCALE) and Clinical blood pressure among patients with hypertension. *J Clin Hypertens (Greenwich)* 15: 637-643.
27. Tan EK, Chung WL, Lew YJ, Chan MY, Wong TY, et al. (2009) Characteristics, and disease control and complications of hypertensive patients in primary-care - a community-based study in singapore. *Ann Acad Med Singapore* 38: 850-856.
28. Abiodun OO, Balogun MO, Adebayo RA, Akintomide AO (2014) Blood pressure control and exaggerated blood pressure response in Nigerians with essential hypertension. *Clin Med Insights Cardiol* 8: 53-56.
29. Tesfaye A (2015) Blood pressure control associates and antihypertensive pharmacotherapy patterns in tikur anbesa general specialized hospital chronic care department, addis ababa, ethiopia. *Am J Biomed Life Sci* 3: 41-48.
30. Mutua EM, Gitonga MM, Mbuthia B, Muiruri N, Cheptum JJ, et al. (2014) Level of blood pressure control among hypertensive patients on follow-up in a Regional Referral Hospital in Central Kenya. *Pan Afr Med J* 18: 27.
31. Richard N (2009) Overweight and Obesity-related hypertension. *Ochsner J* 9: 133-136.
32. Ghembaza M, Senoussaoui Y, Kendouci Tani M, Meguenni K (2014) Impact of patient knowledge of hypertension complications on adherence to antihypertensive therapy. *Curr Hypertens Rev* 10: 41-48.
33. Cordero A, Bertomeu-Martinez V, Mazon P, Lorenzo Facilac, Vicente Bertomeu-Gonzalez, et al. (2011) Factores asociados a la falta de control de la hipertensión arterial en pacientes con y sin enfermedad cardiovascular [Factors associated with uncontrolled hypertension in patients with and without cardiovascular disease]. *Rev Esp Cardiol* 64: 587-593.
34. Jatoi NA, Jerrard-Dunne P, Feely J, Mahmud A (2007) Impact of smoking and smoking cessation on arterial stiffness and aortic wave reflection in hypertension. *Hypertension* 49: 981-989.