



## Original Research

## Uncontrolled hypertension and associated factors among adult hypertensive patients in Dire Dawa, Eastern Ethiopia, 2024: An institutional based cross-sectional study

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### Abstract

**Objective:** Uncontrolled hypertension is a major risk factor leading to stroke, chronic kidney disease, myocardial infarction, and heart failure, and one of the modifiable diseases depends on medication adherence, age, sex, level of education, marital status, behavioral factors, obesity, and smoking. This study aimed to assess the prevalence and associated factors of uncontrolled hypertension among adult hypertensive patients at public healthcare facilities in Dire Dawa, Eastern Ethiopia, 2024.

**Methods:** An institution-based cross-sectional study design was conducted at five randomly selected public health facilities. Binary logistic regression analysis was executed, and all independent variables associated with the dependent variable with  $p \leq 0.25$  were entered into multivariable logistic regression for further analysis. Significant association was identified based on  $p < 0.05$  and adjusted odds ratio (AOR) with 95% CI.

**Results:** A total of 413 patients with hypertension were interviewed with response rate of 402 (97.4%); among them, about 229 (55.4%) were females. The magnitude of uncontrolled hypertension was 176 (42.6%) with 95% CI (41.22, 44.07). Missing appointment dates (AOR=2.545; 95% CI: 1.445, 4.481), poor general knowledge on hypertension self-care practices (AOR=3.848; 95% CI: 2.307, 6.420), comorbidities (AOR=3.509; 95% CI: 2.004, 6.146), and absence of social support (AOR=3.337; 95% CI: 1.727, 6.447) were positively associated with uncontrolled hypertension.

**Conclusion:** Nearly half of patients on medication had uncontrolled blood pressure, mainly due to missed appointments, poor self-care knowledge, lack of social support, and unawareness of target blood pressure; thus, strict adherence, patient education, early comorbidity management, and tailored support are essential for control.

**Keywords:** Dire Dawa, Ethiopia, Hypertension, Prevalence, Uncontrolled Hypertension

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## 1. Introduction

The eighth report of the Joint National Committee (JNC-8) defines hypertension as a persistent raised systolic or diastolic blood pressure (BP) of 140/90 mmHg or above following repeated measurements in adults, and this definition also applies to those individuals who are already taking antihypertensive medications even if their current blood pressure is less than 140/90 mmHg [1]. Uncontrolled hypertension refers to systolic pressure above 140 mmHg or diastolic blood pressure > 90 mmHg in patients on antihypertensive medication for at least 3 months [2].

Depending on the pathogenesis of hypertension, hypertensive patients are diagnosed as having primary, or essential, hypertension, which accounts for more than 90-95% of cases, where the cause of hypertension is unknown, but several factors can increase the risk of developing the condition. Whereas in 5-10% of hypertensive patients a specific cause of hypertension can be found and called secondary hypertension, and it tends to appear suddenly, and various conditions can be responsible, such as renal disease, adrenal disease, thyroid disease, coarctation of the aorta, obstructive sleep apnea, and different anabolic drugs [3].

Uncontrolled hypertension is a major risk factor leading to stroke, chronic kidney disease, myocardial infarction, and heart failure and is one of the modifiable diseases that depends on medication adherence, age, sex, level of education, marital status, behavioral factors, obesity, and smoking [4]. Thus, controlling hypertension leads to a significant reduction in the incidence of target-organ damage and mortality from cardiovascular diseases [5].

Controlling hypertension is the primary goal of hypertension management and follow-up in clinical practices [6]. Hypertension has no cure, but it can be controlled by effective antihypertensive medications and non-drug management such as 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 oneself in physical activity [7, 8].

Globally cardiovascular disease accounts for approximately 17.9 million deaths a year, an estimated 31% of all deaths worldwide. Of this uncontrolled hypertension accounts for 9.4 million, which doubles the risk of mortality of stroke, triples the risk of coronary artery disease, and accelerates the progression of diabetic complications [9]. Globally around one billion individuals are living with hypertension, but their hypertension control rates are less than 30% [10]. In sub-Saharan Africa, hypertension affects about 25% of the adult population, and the prevalence of uncontrolled hypertension is around 70% [11]. In Ethiopia the prevalence of

uncontrolled hypertension among hypertensive patients on treatment is 48%. Almost half of hypertensive patients who were following their treatment did not achieve their target blood pressure [7].

There are different contributing factors to uncontrolled blood pressure, and it makes the management of hypertension more challenging. Among the contributing factors to uncontrolled hypertension are being male, increasing patient age, living in rural areas, low educational level, family history of hypertension, smoking, alcohol consumption, excessive salt consumption, lack of physical activity, overweight, diabetes, increased number of antihypertensive medications prescribed, non-adherence to medications, widowed status, unemployed status, and higher medication cost [12, 13, 14, 15].

Because controlling blood pressure has tremendous public health benefit, attention has been given to improving hypertension management. But uncontrolled hypertension remains a common problem that contributes to significant morbidity and mortality, particularly in low- and middle-income countries, including sub-Saharan Africa (SSA), where management is limited and is experiencing the most devastating challenge [15]. Thus, WHO adopted a global action plan by the World Health Assembly in 2013 to lower the prevalence of premature mortality due to raised blood pressure by 25% by 2025 [16]. The FMOH, in collaboration with WHO and Resolve to Save Lives, launched a three-year project on hypertension to improve prevention and control of hypertension in 2013 (EFY) at public health care facilities in different parts of Ethiopia, including Dire Dawa, but still the control rate of hypertension has remained below 50% [17].

Despite several initiatives, the prevalence of uncontrolled hypertension and adverse impact on cardiovascular morbidity and mortality are increasing globally, irrespective of the income. Several treatment guidelines were developed, and awareness-raising campaigns and population-based screenings and interventions have been implemented in many countries. But implementation was not cost-effective, and many countries were unable to afford it [18]. In Ethiopia the problem of uncontrolled hypertension is challenging, where patients have low levels of follow-up practices. In addition to these, the reasons for uncontrolled hypertension remain unclear and have been insufficiently studied. Such inadequate information regarding the risk factors of uncontrolled hypertension affects the management of hypertension [19].

Understanding the prevalence and determinants of uncontrolled hypertension is essential for enhancing the quality and consistency of patient care. Such evidence supports clinicians in adhering to established hypertension management principles, including regular follow-up visits, patient education on self-care practices and target blood pressure, timely prevention and management of comorbidities, and provision of adequate social support for vulnerable groups. Moreover, the findings provide important insights for regional health bureaus, as well as local and international organizations engaged in hypertension control, by highlighting barriers to effective management. This study may also serve as a useful reference for researchers and readers with an academic interest in the field of hypertension.

## **2. Methods and Materials**

### **2.1. Study Period and Design**

The study was conducted in the Dire Dawa administration, which is found in eastern Ethiopia about 515 km from the capital city, Addis Ababa, 311 km south of Djibouti, and 55 km north of Harar town. According to a report by the Central Statistics Authority (CSA), the total population for 2020 was estimated to be 506,936; of those, 189,000 were male and 188,461 were female. About 67.5% of the population was considered urban inhabitants. According to 2013 (EFY) health and health-related indicators published by FMOH, Dire Dawa had two public general hospitals, fifteen health centers, and thirty-six health posts, with health service coverage of 100% [20]. An institution-based cross-sectional study design was conducted from March 1 to May 30, 2024.

### **2.2. Population**

The source population was all adult hypertensive patients who were on chronic care at public health facilities in Dire Dawa during the data collection period, while the study population was adult hypertensive patients who had follow-up at least for three consecutive months at selected public health facilities in the Dire Dawa city administration during the data collection period. All adult hypertensive patients who were on chronic care at least for three consecutive months before data collection and had a follow-up visit during the data collection period were included in the study. But hypertensive patients who couldn't stand and couldn't communicate were excluded from the study participation.

### 2.3. Sample Size Determination and Sampling Procedure

Sample size was determined from objective one by using a single population proportion formula by considering the following assumptions: level of significance 5% ( $\alpha = 0.05$ ), 95% confidence level ( $Z_{\alpha/2} = 1.96$ ), and  $d =$  margin of error = 5%. A study in Northern Ethiopia in 2019 revealed a prevalence of uncontrolled hypertension of 48.6%, with a CI of 95% [21]. So, taking a 10% non-response rate, the sample size was 424.

Sample size for objective two was determined using the double population formula by using Epi Info version 7 by considering the following assumptions: confidence interval (CI) 95%, power 80%, and non-response rate 10%. The factors were taken from [22,23] (Table 1). There were nine urban public health centers and two public general hospitals in Dire Dawa City during the data collection period. From these nine urban public health centers, four urban public health centers and, from these two public general hospitals, one public general hospital were selected by using the lottery method.

The calculated sample size was assigned to those selected public health facilities by proportionally allocating it to each facility as follows based on the preliminary survey of the facilities' patient flow. Sabian General Hospital = 117 patients, Goro Health Center = 127 patients, Dechatu Health Center = 98 patients, Gende Gerada Health Center = 45 patients, and Melka Health Center = 37 hypertensive patients until the required sample size (424) was obtained during the actual data collection period (1 month) by using the systematic sampling method.

### 2.4. Variables

#### 2.4.1. *Dependent Variable*

- Uncontrolled hypertension

#### 2.4.2. *Independent Variables*

- **Socio-demographic variables:** age, sex, average monthly income in Ethiopian birr, marital status, religion, educational status, occupation, residence, and social support.
- **Clinical characteristics of patients:** family history of hypertension, co-morbidity presence, duration of the disease, experiencing side effects, number of medications, frequency of follow-up.
- **Behavioral practices:** adherence to anti-hypertensive medication, physical activity, dietary management, and alcohol and smoking status of the participants.

## 2.5. Measurement and Definition

Uncontrolled hypertensive patients are defined as anyone who had follow-up at outpatient chronic disease clinics of the public health institutions in the Dire Dawa city administration with systolic blood pressure of  $\geq 140$  mmHg or diastolic blood pressure of  $\geq 90$  mmHg after commencing hypertension treatment for at least three months by measuring their blood pressure with a standard digital blood pressure apparatus two times at least 5 minutes apart and taking the average measurement with proper measuring technique and positions [24].

Medication adherence: Three questions containing the number of days in the last 7 days were assessed for medication adherence. The responses were summed (range: 0–21), and the participants who reported that they had followed these three recommendations on all weekdays are considered adherents (score = 21) [25].

General knowledge on hypertension self-care practices: Participants were labeled as having good knowledge if they scored at or above the mean and poor knowledge if they scored below the mean. From the hypertension knowledge-level scale (HK-LS) tool, twenty-two questions were used to measure the knowledge of the response of participants in each question [26].

Adherent to Dietary Management: Twelve questions were used to assess practices related to eating a healthy diet, avoiding salt while cooking and eating, and avoiding foods high in salt content. Scores of 6 or better were considered adherent, and scores of less than 6 were nonadherent [28].

## 2.6. Data Collection Tools and Procedures

An interviewer-administered structured English version questionnaire was adapted from validated hypertension self-care activity level effects (H-SCALE) scales, hypertension knowledge-level scale (HK-LS) tools, and published articles [23,29,30,26,28] and amended for the context of the study. The questionnaire contains socio-demographic characteristics, clinical profiles of the patients, knowledge about hypertension, and self-care practice.

During commencement of data collection, data collectors should measure participants' blood pressure with a standard digital blood pressure apparatus and with proper measuring technique and positions two times at least 5 minutes apart and take the average reading. Weight and height were measured with participants standing without shoes and wearing light clothing. Participants were standing upright with the head in the Frankfort plane for height measurement.

Bodyweight (kg) was measured using an electronic scale to the nearest 10 g, and standing height was measured using a wall stadiometer to the nearest 0.1 cm. BMI is calculated as body weight (kg)/height (m<sup>2</sup>). The subjects were classified into four WHO BMI cut-off points. Underweight is < 18.5, normal range is 18.5-24.9, overweight is 25-29.9, and obese is  $\geq 30$  [25].

## 2.7. Data Processing and Analysis

Data were cleaned, coded, and entered by using Epi-Data v. 7 and then exported to SPSS 25 for analysis. Descriptive analysis was conducted to summarize the data, and the final result of the study was presented in the form of text, figures, and tables. Binary logistic regression analysis was executed by computing odds ratio (OR) with a 95% confidence interval to see the crude association between each independent and dependent variable. Model fitness was checked by using the Hosmer and Lemeshow goodness of fit. Finally, all independent variables associated with the dependent variable with  $p \leq 0.25$  were entered into multivariable logistic regression for further analysis, then significant associations were identified based on  $p < 0.05$  and adjusted odds ratio with 95% CI.

## 3. Results

### 3.1. Socio-Demographic Characteristics

Out of 424 hypertensive patients planned to be included in the study, 413 were interviewed, with a response rate of 97.4%. From the total 413 study participants, female participants were 229 (55.4%). More than half, 258 (62.5%), had ages greater than 51 years; of these, 86 (33.4%) were 60 years and above. One-third 143 (34.6%) of participants had never attained formal education. Nearly all 409 (99%) of the study participants were urban inhabitants (Table 1).

**Table 1:** Socio-demographic characteristics of hypertensive participants at public health facilities in Dire Dawa, East Ethiopia, 2024, (n=413)

Characteristics	Category	Frequency	Percent (%)
Sex	Male	184	44.6
	Female	229	55.4
Age (years)	18-30	4	1
	31-40	49	11.9
	41-50	102	24.7
	51-60	120	29.1
	60+	138	33.4
Marital status	Single	61	14.8
	Married	259	62.2
	Widowed	43	10.4
	Divorced	50	12.1

Occupation	Farmer	8	1.9
	Civil Servant	96	23.2
	Merchant	147	35.6
	House wife	83	20.1
	Retired	43	10.4
Family income (ETB)	Daily laborer	36	8.7
	<5,000	198	47.9
	5,000-10,000	136	32.9
Educational level	>10000+	79	19.1
	No formal education	143	34.6
	Primary educational level	122	29.5
	Secondary educational level	92	22.3
Residence	College and above	56	13.6
	Urban	409	99
	Rural	4	1

**Note:** ETB – Ethiopian Birr

### 3.2. Clinical Characteristics of the Study Participants

In terms of duration of hypertension since the time of diagnosis, 274 (66.3%) of them were followed for the last 5 years and above. A family history of HTN was identified in 103 (24.9%) of the study participants. More than half, 228 (55.2%), of the study participants had no adequate knowledge of target BP. More than two-thirds, 287 (69.5%), of the study participants had taken two or more drugs, and 156 (37.8%) of the participants experienced drug side effects; of these headache accounts, 261 (63.2%) were due to side effects (Table 2).

**Table 2:** Clinical characteristics of hypertensive patients at public health facilities in Dire Dawa, East Ethiopia, 2024, (n=413)

Variable	Category	Frequency (Percentage %)
Hypertension status	Controlled	237 (57.4)
	Uncontrolled	176 (42.6)
Duration of hypertension	<5 years	139 (33.7)
	≥5years	274 (66.3)
Family history of HTN	Yes	103 (24.9)
	No	310 (75.1)
Knowledge on target BP	know	185 (44.8)
	Didn't know	228 (55.2)
General knowledge on HTN self-care practices	Good	262 (63.4)
	Poor	151 (36.5)
Number of drugs	One	126 (30.5)
	Two or more	287 (69.5)
Source of drugs	CBHI	321 (77.7)
	Free of charge	21 (5.1)
	Self	71 (17.2)
Experiencing drug side effect	Yes	155 (37.8)
	No	257 (62.2)
Types of drug side effect	Erectile dysfunction	14 (9)

	Headache	98 (63.2)
	Dry mouth	39 (25.2)
	Others	4 (2.6)
Body mass index (kg/m <sup>2</sup> )	Under weight (<18.5)	7 (1.7)
	Normal (18.5-24.9)	264 (63.9)
	Over weight (25-29.9)	121 (29.3)
	Obese (>30)	21 (5.1)

**Note:** BP – Blood Pressure, HTN – Hypertension

### 3.3. Behavioral Practices of Sampled Hypertensive Patients

More than two-thirds of the participants, 277 (67.1%) and 276 (66.8%), were non-adherent to hypertension medication protocols and were not following a low-salt diet, respectively. The majority of the participants, 371 (89.8%), were nonsmokers, & 325 (78.7%) of the participants did not adhere to weight management practices (Table 3).

**Table 3:** Behavioral practices of hypertensive patients at public health facilities in Dire Dawa, East Ethiopia, 2024, (n=413)

Variable	Category	Frequency (Percentage %)
Medication adherence	Yes	136 (32.9)
	No	277 (67.1)
Diet adherence	adherent	148 (35.8)
	Non-adherent	265 (64.2)
Physical activity	Physical active	179 (43.3)
	Physical inactive	234 (56.7)
Alcohol drinking habits	drunker	49 (11.9)
	abstainer	364 (88.1)
Smoking status	smoker	42 (10.2)
	Non-smoker	371 (89.8)
Weight Management	good	88 (21.3)
	poor	325 (78.7)
Low salt diet adherence	adherent	137 (33.2)
	Non-adherent	276 (66.8)
Social support	had	337 (81.6)
	Didn't have	76 (18.4)
Frequency of follow up	Monthly	391 (94.7)
	Every two monthly	17 (4.1)
	Quarterly	5 (1.2)
Missing appointment date	Yes	144 (34.9)
	No	269 (65.1)

### 3.4. Prevalence of Uncontrolled Hypertension

Most of the participants with ages from 18 to 30 years and greater than 60 years had uncontrolled hypertension, with 75% and 79%, respectively, whereas those participants with ages between 31 and 40, 41 and 50, and 51 and 60 years had uncontrolled hypertension with 16.3%, 9.8%, and 38.3%, respectively. From the total (176) uncontrolled hypertensive

participants, 98 (55.7%) were females. The overall prevalence of uncontrolled hypertension of the study participants was 176 (42.6%) with a 95% CI of (41.22, 44.07).

### 3.5. Factors Associated with Uncontrolled Blood Pressure

A significant association was identified between uncontrolled blood pressure and comorbidity, knowledge on target BP, social support, general knowledge on HTN self-care practices, and missing appointment date with multivariable logistic regression analysis. Regarding knowledge of participants on their target blood pressure (less than 140/90 mmHg), those who didn't know their target blood pressure were 2.6 times more likely to have uncontrolled blood pressure when compared to those who knew their target blood pressure (AOR = 2.57; 95% CI: = 1.44, 4.59). Hypertensive patients with missing appointment dates were 2.5 times more likely to have uncontrolled blood pressure compared to those who didn't miss appointment dates (AOR = 2.54; 95% CI: 1.44, 4.48).

Hypertensive patients with comorbidities were 3.5 times more likely to have uncontrolled hypertension as compared to those without comorbidities (AOR = 3.51; 95% CI: 2.00, 6.15). The likelihood of uncontrolled blood pressure was 4 times more among participants with poor general knowledge on HTN self-care practices (AOR = 3.85; 95% CI: 2.31, 6.42);  $p = 0.000$ . Hypertensive patients who didn't have social support were 3.3 times more likely to have uncontrolled hypertension as compared to those who had social support (AOR = 3.34; 95% CI: 1.73, 6.45) (Table 4).

**Table 1.** Bivariable and multivariable regression for factors associated with uncontrolled hypertension among adult hypertensive patients on follow up at public health facilities in Dire Dawa, East Ethiopia, 2024, (n=413)

Variable	Category	Hypertension Status		COR (95% CI)	AOR (95% CI)	P-Value
		Uncontrolled	Controlled			
Sex	Male	78 (18.9)	105 (25.4)	1.00 (0.68,1.48)	1.56(0.94,2.59)	0.083
	Female	98 (23.7)	132 (31.0)	1	1	
Educational level	No education	81 (19.6)	62 (15.0)	3.00 (1.55,5.79)	0.80(0.32,1.96)	0.626
	Primary	49 (11.9)	73 (17.7)	0.51 (0.32,0.84)	0.76(0.30,1.90)	
	Secondary	29 (7.0)	63 (15.3)	0.35 (0.20,0.61)	0.56(0.22,1.47)	
	College & above	17 (4.1)	39 (9.4)	1	1	
Knowledge on target BP	Know	48 (11.6)	137 (33.2)	1	1	0.001*
	Don't know	128 (31.0)	100 (24.2)	3.65 (2.40,5.56)	2.57(1.44,4.59)	
Duration of HTN	<5 years	48 (11.6)	91 (22.0)	1	1	0.142
	≥5years	128 (31.0)	146 (35.4)	1.66 (1.09, 2.54)	1.50(0.87,2.58)	
Missing of appointment comorbidity	Yes	101 (24.5)	43 (10.4)	6.08 (3.89,9.48)	2.54(1.44,4.48)	0.001*
	No	75 (18.2)	194 (47.0)	1	1	
	Yes	77 (18.6)	51 (12.3)	2.84 (1.85,4.36)	3.51(2.00,6.15)	
Weight management	No	99 (24.0)	186 (45.0)	1	1	0.000*
	Good	26 (6.3)	63 (15.3)	1	1	
	Poor	150 (36.3)	174 (42.1)	2.09 (1.26,3.47))	1.04(0.51,2.11)	0.911

Smoking status	Non-smoker	149 (36.1)	222 (53.8)	1	1	
	smoker	27 (6.5)	15 (3.6)	2.68 (1.38,5.21)	1.01(0.43,2.41)	0.976
Physical activity	Active	47 (11.4)	132 (32.0)	1	1	
	Inactive	129 (31.2)	105 (25.4)	3.45 (2.27,5.27))	1.26(0.74,2.14)	0.392
Social support	Don't have	49 (11.9)	27 (6.5)	3.00 (1.79,5.04)	3.34(1.73,6.45)	0.000*
	Have	127 (30.8)	210 (50.8)	1	1	
General knowledge on Self-care practices	Good	82 (19.9)	180 (43.6)	1	1	
	Poor	94 (22.8)	57 (13.8)	3.62 (2.38,5.51)	3.85(2.31,6.42)	0.000*

Hosmer and Lemeshow Test = 0.509

\*Significant association  $p < 0.05$

#### 4. Discussion

The natural course of hypertension can be modified with the use of effective and inexpensive medications, and achieving its target reduces all hypertension-related complications; thus, achieving targeted blood pressure control is the primary goal of hypertension management and follow-up in clinical practices [6, 31]. The primary target of this study was to assess the prevalence and associated factors of uncontrolled hypertension among adult hypertensive patients receiving care at public healthcare facilities in Dire Dawa, Eastern Ethiopia, 2024. This study revealed that the magnitude of uncontrolled blood pressure was 42.6% 95% CI (41.22, 44.07), and missing appointment dates, poor general knowledge on hypertension self-care practices, absence of social support, comorbidities, and those who didn't know their target blood pressure (less than 140/90 mmHg) were positive predictors of uncontrolled hypertension.

This study identified that the prevalence of uncontrolled hypertension was 42.6% with 95% CI (41.22, 44.70). This observation was lower than results of studies done in Ethiopia; Mekelle, Bedele, Bale, and Dessie; with a prevalence of 48.6%, 56.2%, 56.7%, and 55.8% with 95% CI, respectively [21, 32, 33, 34]. This could be due to the setting in which our study populations were selected from urban residents, differences in lifestyle behaviors, educational level, availability of resources for HTN management, and the level of adherence to HTN management protocols.

This result was also lower than other studies conducted in different parts of the world: Zimbabwe, South Africa, India, and China, with a prevalence of 67.2%, 56.83%, 46.15%, and 67.7%, respectively [35, 36, 37, 22]. This could be due to the difference in drug adherence level, study population, degree of urbanization, differences in lifestyle behaviors, environmental conditions, quality of care, and the countries' health systems. However, the magnitude of uncontrolled hypertension in this study was higher than the finding of a previous study done at the University of Gondar Hospital, Ethiopia (37%) [24]. This could be due to the setting in which

the study was conducted since it was hospital-based, the availability of resources for HTN management, the level of adherence to HTN management protocols, the availability of specialists since it is a teaching hospital, and differences in lifestyle behaviors of the study population.

The likelihood of uncontrolled hypertension was 4 times more among participants with poor general knowledge on HTN self-care practices (AOR = 3.85; 95% CI: 2.31, 6.42). This observation is consistent with a previous study conducted in Hawassa 3.13 (1.43, 6.82) with a 95% CI [23]. This could be due to poor knowledge of hypertension self-care practices having an effect on uncontrolled hypertension since it affects the level of physical activity, the quality of health education and counseling on HTN, and differences in lifestyle practices and drug adherence.

Regarding knowledge of participants on their target blood pressure (less than 140/90 mmHg), those who didn't know their target blood pressure were 2.6 times more likely to have uncontrolled hypertension when compared to those who knew their target blood pressure (AOR = 2.57; 95% CI: 1.44, 4.59). Setting and knowing the target blood pressure with the treating physician and adhering to it is one of the vital hypertension management goals since it is important to monitor the patients' hypertension status and treatment outcome. This study showed that hypertensive patients with missing appointment dates were 2.5 times more likely to have uncontrolled hypertension compared to those who didn't miss appointment dates (AOR = 2.54; 95% CI: 1.44, 4.48). This could be patients who missed their appointment date also missed daily drug intake and had poor hypertension self-care practice.

Hypertensive patients with comorbidities were 3.5 times more likely to have uncontrolled hypertension as compared to those without comorbidities (AOR = 3.51; 95% CI: 2.00, 6.15). This result is consistent with a study conducted at Bedele and Tigray, 2.16 (1.22, 3.82) and 2.11 (1.22–3.66 with 95% CI), respectively [32, 29]. This could be due to patients with another comorbidity having an extra burden of drug side effects, drug-drug interactions, and pill burden and the effect of the comorbidity on controlling HTN itself. This result is consistent with a study conducted in South Africa and DR. Congo: 5.66 (93.33, 9.600) and 2.40 (1.01, 5.74) with 95% CI, respectively [37, 38]. This could be due to patients with another comorbidity having an extra burden of drug side effects, drug-drug interactions, and pill burden and the effect of the comorbidity on controlling HTN itself and the pathogenesis of the comorbidity.

Hypertensive patients who didn't have social support were 3.3 times more likely to have uncontrolled hypertension as compared to those who had social support (AOR = 3.34; 95% CI: 1.73, 6.45). This result was also higher than a study conducted at Dessie 1.24 (1.01, 1.54) with a 95% CI [34]. This could be due to the presence of cultural differences, environmental factors, and differences in lifestyle behaviors of the study population and financial, social, and psychological conditions of the population. Another study conducted in Zimbabwe revealed those with social support were less likely to have uncontrolled hypertension 0.06 (0.02-0.17) [30]. This could be due to good support from families, friends, or relatives in terms of financial, social, and psychological support in caring for patients to adhere to their treatment. The study might face recall and social desirability bias since it was based on self-reports. Additionally, causal inferences cannot be drawn from this study due to the nature of the cross-sectional study design.

## 5. Conclusion

This study revealed that prevalence of uncontrolled hypertension was high even though they had been on medication. Poor knowledge on hypertension self-care practice, missing of appointment dates, comorbidities and absence of social support were significantly associated to uncontrolled hypertension. Attaining controlled blood pressure is important to avoid consequences of uncontrolled hypertension by adhering to the hypertension management principles strictly i.e. adhere to appointment dates, acquired proper knowledge both on hypertension self-care practice and their target blood pressure, prevention, early diagnosis and management of comorbidities and providing appropriate social support for those who needs special attention.

## Abbreviations

AOR: Adjusted Odd Ratio, BMI: Body Mass Index, BP: Blood Pressure, CI: Confidence Interval, CSA: Central Statistical Authority, FMOH: Federal Ministry of Health, HTN: Hypertension, SSA: Sub-Saharan Africa, SPSS: Statistical Package for Social Science, WHO: World Health Organization.

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### **Authors Contribution**

All authors made significant contributions throughout the study, from the initial conception of the research idea to proposal development, data collection, data analysis and interpretation, and manuscript preparation. They also actively participated in proposal development, data analysis, and manuscript drafting for publication. All authors reviewed and approved the final version of the manuscript.

### **Ethics Approval**

Ethical clearance for study was obtained from Institutional Review board (IRB) of CMHS and supporting letter was obtained from Dire Dawa city administration health bureau. Informed oral consent was obtained from study participants. Participants were informed that all the data obtained from them were kept confidential and anonymous. To ensure confidentiality, names of respondents were replaced by code numbers. The study participants would have the right to withdraw at any point during data collection.

### **Conflicting Interests**

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### **Availability of Data and Materials**

The data supporting this finding can be available at any time with a request. If someone wants to request the data you can communicate the corresponding Authors with email.

### **References**

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