

# Treatment Outcome and Associated Factors Among Patients Admitted with Hypertensive Crisis in Public Hospitals at Harar Town, Eastern Ethiopia: A Cross-Sectional Study

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**Background:** Hypertensive crisis is a significant global health issue that raises the costs to healthcare systems and requires specific attention to improve clinical outcome. There is scarce information on hypertensive crisis cases treatment outcome in the study setting.

**Objective:** This study aimed to assess treatment outcome and associated factors among patients admitted with hypertensive crisis at Public Hospitals in Harar Town, Eastern Ethiopia.

**Methods:** A cross-sectional study was conducted among 369 hypertensive crisis patients who had been admitted to the emergency department of Hiwot Fana Comprehensive Specialized Hospital and Jugol General Hospital from May 1, 2017, to May 1, 2022. All hypertensive crisis patients who fulfilled the inclusion criteria were included. The data were extracted from medical records using a data abstraction format. The collected data were analyzed using Statistical Package for Social Sciences version 22. Binary logistics regression model using bivariate and multivariable analysis with 95% confidence intervals and *P*-values were used to determine the association between variables.

**Results:** The medical records of 369 patients in total were reviewed. Of these, the medical records of 363 patients contained all the necessary information and were used in the study. More than half of the patients (238; 65.6%) were males. Among 363 patients admitted with hypertensive crisis, 98 (27.0%, 95% Confidence Interval (CI):22.5%-31.9%) of them had poor treatment outcome of hypertensive crisis. Being female (Adjusted Odds Ratio (AOR)=3.4; 95% CI=1.7–7.9), residing in rural areas (AOR=2.4; 95% CI=2.7–5.1), taking captopril during admission (AOR=5.6; 95% CI=2.4–7.9), taking antihypertensive treatment before admission (AOR=0.5; 95% CI=0.2–0.9), and being non compliant to treatment (AOR=2.7; 95% CI=1.4–3.5) had statistically significant associations with poor treatment outcome of hypertensive crisis compared to their counterparts.

**Conclusion:** The magnitude of poor treatment outcome of hypertensive crisis was high. Sex, residence, non-compliance, and type of emergency drug administered during admission were substantially related with poor treatment outcome of hypertensive crisis. Health professionals should put great emphasis on emergency drugs administered during admission to achieve the desired outcome.

**Keywords:** hypertensive crisis, treatment, outcome, Eastern Ethiopia

## Introduction

Over 80% of deaths from hypertension and related cardiovascular disorders occur in low- and middle-income countries, with the prevalence of hypertension predicted to reach more than 29% globally by 2025.<sup>1</sup> The hypertensive crisis is a big

worldwide health problem that increases the costs to health systems and needs special emphasis to improve clinical outcomes such as blood pressure control, complications, and mortality rate.<sup>2</sup>

Hypertensive crisis is defined as systolic blood pressure  $\geq 180$  mm Hg or diastolic blood pressure  $\geq 120$  mm Hg.<sup>3–5</sup> Hypertensive Emergency (HE) and Hypertensive Urgency (HU) are two classes of a hypertensive crisis. HE is distinguished from HU by the quick degeneration of target organs (heart, brain, kidneys, and arteries) and the urgent threat to life it poses. Certain patients do not require anti-hypertensive treatment in the emergency room because they do not exhibit acute target organ damage (TOD) or a life-threatening condition, regardless of blood pressure levels.<sup>6</sup>

According to the findings of many studies, the prevalence of hypertension crisis is rising. HE rose from 3,309 - per million cases in 2006 to 6,178 per million cases in 2013, according to a study done in an emergency clinic in the USA.<sup>7</sup> According to a study done in Tanzania, around 68% of hypertensive patients admitted to the emergency room experienced hypertensive emergency.<sup>8</sup> Likewise, another study found that hypertensive emergency accounted for 24% of hypertensive crisis cases.<sup>9</sup>

Uncontrolled blood pressure is more common in Ethiopia, which could put people at risk for hypertensive crisis. According to research among hypertension patients at Ayder Comprehensive Specialized Hospital, 52.5% of participants had uncontrolled blood pressure. More than one-fourth of patients (42; 29.8%) had hypertensive emergency, but more than two-thirds of patients (99; 70.2%) exhibited no signs of organ damage.<sup>6,10</sup>

Epidemiological information on the hypertensive crisis and its treatment outcome are limited in the setting of this study. Hence, this study is aimed to assess the treatment outcomes of hypertensive crisis and identify factors associated with treatment outcomes among hypertensive crisis patients who had been admitted to the emergency department in the study setting.

## Methods and Materials

### Study Area, Design, and Period

A cross-sectional study was conducted in the emergency departments of Hiwot Fana Comprehensive Specialized Hospital (HFCSH) and Jugol General Hospital (JGH). HFCSH serves as a referral hospital for Eastern Ethiopia, including Eastern Oromia, Dire Dawa City Administration, the Somali Regional State, and the Harari Regional State. Approximately 5,800,000 people are anticipated to live within the hospital's catchment area, of which 2.85 million are female and 2.95 million are male.<sup>11</sup> Currently, the hospital has roughly 238 beds with 294 functional rooms to provide a variety of services for the community. JGH is located in Feres Megala, Harari Region, Harar. The hospital provides services in Infectious & Tropical Diseases, Pediatrics, Emergency/Disaster Medicine, Women's Health, Obstetrics and Gynecology, and Maternal–Fetal Medicine. The data were collected from May 2, 2022 to May 17, 2022.

### Source and Study Population

The source population includes all adult hypertensive crisis patients who were admitted at the emergency departments of HFCSH and JGH. All adult hypertensive crisis patients who were admitted to the emergency department of HFCSH and JGH from May 1, 2017 to May 1, 2022, were the study population for this study.

### Eligibility Criteria

All adult hypertensive crisis patients who were admitted at the emergency department of both hospitals were included. Hypertensive crisis cases with incomplete information on the medical record were excluded.

### Sample Size and Sampling Procedure

There are two public hospitals (namely Hiwot Fana Comprehensive Specialized Hospital (HFCSH) and Jugol General Hospital (JGH)) in Harar town. Between May 1, 2017, and May 1, 2022, a total of 369 cases of hypertensive crises were recorded in the emergency department registries of the two public hospitals (236 in HFCSH and 133 in JH). Of these, 363 hypertensive crisis cases had complete data (232 in HFCSH and 131 in JH) and were included in the study. Hence, the sampling technique was a census type (included all cases who fulfilled the inclusion criteria).

## Data Collection Method

The required data from patients' medical records were recorded using a data abstraction format that was adopted from several studies.<sup>6,12,13</sup> The English language version of the data abstraction format has been produced. Data abstraction format consists of socio-demography and clinical characteristics, treatment, and outcome of the hypertensive crisis patients. From the doctor's initial assessment sheet, sociodemographic information and clinical traits were noted. On the other hand, vitals sheets were used to record blood pressure readings for nursing services at discharge. The follow-up sheet was used to record treatment compliance, which was evaluated and documented on each patient visit. Only the most recent visit was counted for patients who had several visits due to a hypertensive crisis. By using the medical record numbers from the emergency department's registration manual, the medical histories of patients with hypertensive crisis were obtained. The medical records were retrieved from the medical record room after choosing the patient records' numbers for hypertensive crisis patients. Three BSc nurses used a data abstraction format to obtain the relevant information.

## Data Quality Control

Prior to the commencement of the actual data extraction, the data abstraction format was pretested on 5% randomly selected patients' medical records who were experiencing hypertensive crisis at Haramaya General Hospital. During the pretest data collection, the data collectors identified as the drug regimen administered before admission and history of previous admission were available on medical records but not on the prepared data abstraction format. The data abstraction format's final version was modified to address the errors that were identified during the pretest phase. Prior to collecting data, the data collectors received training. The supervisor oversaw and verified the data to guarantee its uniformity and completeness. When managing, storing, and analyzing the data, each piece of information was checked for accuracy and consistency.

## Operational Definitions

Hypertensive crisis is defined as an acute elevation of blood pressure  $\geq 180$  mmHg systolic and/or  $\geq 110$  mmHg diastolic.

Hypertensive crisis: in this study hypertensive crisis of patients could be hypertensive emergency or hypertensive urgency.

Hypertensive emergency: defined as an acute elevation of blood pressure  $\geq 180$  mmHg systolic and/or  $\geq 110$  mmHg diastolic accompanied by acute target organ damage such as myocardial infarction, acute or worsening heart failure, pulmonary edema, ischemic stroke, hemorrhagic stroke, acute kidney injury, aortic dissection, hypertensive encephalopathy, and acute hypertensive retinopathy.

Hypertensive urgency: defined as an acute elevation of blood pressure  $\geq 180$  mmHg systolic and/or  $\geq 110$  mmHg diastolic without evidence of acute target organ damage.

Treatment outcome of hypertensive crisis: In this study, treatment outcome of hypertensive crisis could be good or poor.

Poor treatment outcome: death due to hypertensive crisis or referred to other hospitals due to unimproved status of hypertensive crisis based on final physician's assessment.

Good treatment outcome: improved status of hypertensive crisis based on final physician's assessment and discharged from the emergency department.

## Data Analysis and Presentations

The data were imported using Epi Data statistical software version 3.1 and exported to Statistical Packages for Social Sciences (SPSS) version 22 for coding, cleaning, and analysis. Mean and standard deviation (SD) were used to summarize continuous variables, while frequency and percentage were used to portray categorical information. A binary logistics regression model using bivariate (Crude Odds Ratio (COR)) and multivariable analysis (Adjusted Odds Ratio (AOR)) with 95% confidence intervals and *P*-value were used to determine the association between variables. Variables with a *P*-value of less than or equal to 0.25 were transferred to a multivariable logistic regression analysis and the confounding variables were controlled here in the final model. The presence and strength of association between

dependent and independent variables was determined by the adjusted odds ratio and its 95% CI. A *P*-value of less than 0.05 was taken to show the presence of statistical significance.

## Results

### Patient Characteristics

The medical records of 369 patients were reviewed. Of those, the medical records of 363 patients contained all the necessary information and were used in the study. Nearly 55% of participants were above the age of 40 years. The mean age of participants was 41.2 years, with a standard deviation (SD) of 15.4. The majority of the participants (238; 65.6%) were males. About 260 participants lived in urban areas. The majority of patients (65.8%) had a history of pre-existing hypertension during admission. Thirty-one participants had organ damage by acute renal failure (Table 1).

### Types of Hypertensive Crisis, Clinical Presentation, and Previous Treatment

Nearly 70% of participants were admitted with hypertensive urgency. Seventy-one patients had a clinical presentation of headache. More than half of the study participants (239; 65.8%) were on antihypertensive treatment before admission with hypertensive crisis. Of those who were on antihypertensive treatment, 65 (17.9%) participants took diuretics. More than half of the patients (149; 62.3%) were compliant to their treatment (Table 2).

**Table 1** Patient Characteristics of Emergency Department, Public Hospital, Harar, Ethiopia, 2022

Characteristics	All Patients (N=363)	Hypertensive Emergency (N= 111)	Hypertensive Urgency (N=252)
Sex			
Female	125 (34.4%)	28 (22.4%)	97 (77.6%)
Male	238 (65.6%)	83 (34.9%)	155 (65.1%)
Age (years)			
<30	102 (28.1%)	37 (36.3%)	65 (63.7%)
30–39	68 (18.7%)	23 (33.8%)	45 (66.2%)
≥40	193 (53.7%)	51 (26.4%)	142 (73.6%)
Residence			
Urban	260 (71.6%)	94 (36.2%)	166 (63.8%)
Rural	103 (28.4%)	17 (16.5%)	86 (83.5%)
Pre-existing hypertension			
Yes	239 (65.8%)	64 (26.7%)	176 (73.6%)
No	124 (34.1%)	86 (69.4%)	38 (30.6%)
Target organ damage			
Acute renal failure	31 (8.5%)	31	0
Hypertensive encephalopathy	18 (5.0%)	18	0
Intracerebral/SAH	12 (3.3%)	12	0
Ischemic stroke	21 (5.8%)	21	0
Acute pulmonary edema	14 (3.9%)	14	0
Retinopathy	15 (4.1%)	15	0
History of previous admission			
Yes	252 (69.4%)	16 (6.3%)	236 (93.7%)
No	111 (30.6%)	99 (89.2%)	12 (10.8%)
Length of hospital stay (day)			
<7	112 (30.9%)	87 (77.7%)	25 (22.3%)
≥7	251 (69.1%)	203 (80.9%)	48 (19.1%)

**Abbreviation:** SAH, subarachnoid hemorrhage.

**Table 2** Clinical Presentation and Previous Treatment, Public Hospital, Harar, Ethiopia, 2022

Characteristics	All Patients (N=363)	Hypertensive Emergency (N= 111)	Hypertensive Urgency (N=252)
Clinical Presentation			
Headache	71 (19.6%)	23 (36.5%)	40 (63.5%)
Dyspnea	45 (12.4%)	28 (62.2%)	17 (37.7%)
Dizziness	63 (17.4%)	16 (25.3%)	47 (74.6%)
Palpitation	57 (15.7%)	19 (33.3%)	38 (67.7%)
Chest pan	50 (13.8%)	36 (72.0%)	14 (28.0%)
Shortness of breath	42 (11.6%)	26 (61.9%)	16 (38.1%)
Vomiting	35 (9.6%)	21 (60.0%)	14 (40.0%)
Before admission on an hypertensive treatment			
Yes	239 (65.8%)	26 (10.9%)	213 (89.1%)
No	124 (34.2%)	89 (71.7%)	35 (28.2%)
Before admission regimen			
Monotherapy	126 (34.7%)	14 (11.1%)	112 (88.9%)
Combination therapy	113 (31.1%)	12 (10.6%)	101 (89.3%)
Class of antihypertensive drugs taken			
Diuretics	65 (17.9%)	4 (6.1%)	61 (93.8%)
CCBs	36 (9.9%)	6 (16.6%)	29 (80.5%)
ACEIs	25 (6.9%)	5 (20.0%)	20 (80%)
CCBs/Diuretics	48 (13.2%)	4 (8.3%)	44 (91.6%)
Diuretics/ACEIs	65 (17.9%)	7 (10.8%)	58 (89.2%)
Compliance to treatment			
No	90 (37.7%)	11 (12.2%)	79 (87.7%)
Yes	149 (62.3%)	15 (10.06%)	134 (89.9%)

**Abbreviations:** CCBs, calcium channel blockers; ACEIs, angiotensin converting enzyme inhibitors.

## Treatment and Outcome

Thirty-one percent of the patients required oxygen supplementation, and near to 30% of patients needed ventilator support. Captopril was given to 70.2% of patients, while 29.8% were given intravenous hydralazine. Forty-one percent of patients were given IV fluid supplementation (Table 3). Among the admitted patients; 73% were discharged with an improvement of hypertensive crisis, while 17.07% had an unimproved status of hypertensive crisis at discharge and 9.9% died. All death was due to a hypertensive emergency. Among the 252 patients who were admitted with hypertensive urgency, 40 (15.9%) patients had poor treatment outcome. Of 111 patients who were admitted with hypertensive emergency, 58 (52.3%) patients had poor treatment outcome. Overall, among the 363 patients admitted with hypertensive crisis, 98 (27%, 95% CI= 22.5%–31.9%) patients had a poor treatment outcome (Figure 1).

## Factors Associated with Poor Treatment Outcome of Hypertensive Crisis

In the multivariable logistic regression analysis, sex, residence, emergency drug administered during admission, and compliance to their treatment were significantly associated with poor treatment outcome of hypertensive crisis. Participants who were female were 3.4-times more likely to have poor treatment outcome of hypertensive crisis than those who were male: Adjusted Odds Ratio (AOR)=3.4; 95% confidence interval (CI)=1.7–7.9;  $P=0.01$ . The odds of poor treatment outcome of hypertensive crisis were 2.4-times higher among patients who lived in rural areas as compared to those who lived in the urban areas: AOR=2.4; 95% CI=2.7–5.1;  $P=0.03$ . Participants who were on captopril during admission were 5.6-times more likely to have a poor treatment outcome of hypertensive crisis as compared to those who were on hydralazine: AOR=5.6; 95% CI=2.4–7.9;  $P=0.01$ . The odds of a poor treatment outcome of hypertensive crisis decreased by 50% among patients who were on antihypertensives before admission.

**Table 3** Treatment of Hypertensive Crisis Patients and Laboratory Investigation During Admission, Public Hospital, Harar, Ethiopia, 2022

Treatment	All Patients (N=363)	Hypertensive Emergency (N= 111)	Hypertensive Urgency (N=252)
Oxygen supplementation			
Yes	113 (31.1%)	98 (86.7%)	15 (13.3%)
No	250 (68.9%)	26 (10.4%)	224 (89.6%)
Ventilator support			
Yes	98 (27.0%)	75 (76.5%)	23 (23.5%)
No	265 (73.0%)	27 (10.2%)	238 (89.8%)
<b>Emergency drug administered during admission</b>			
<b>Captopril</b>	<b>255 (70.2%)</b>	<b>30 (11.8%)</b>	<b>225 (88.2%)</b>
<b>Hydralazine</b>	<b>108 (29.8%)</b>	<b>81 (75.0%)</b>	<b>27 (25.0%)</b>
IV fluid supplementation			
Yes	150 (41.3%)	122 (81.3%)	28 (18.7%)
No	213 (58.7%)	19 (8.9%)	194 (91.1%)
Investigations			
Blood chemistry	58 (15.9%)	46 (79.3)	12 (20.7%)
Complete blood count	77 (21.2%)	60 (77.9%)	17 (22.1%)
Urine analysis	48 (13.2%)	35 (72.9%)	13 (27.1%)
Electrocardiogram	16 (4.4%)	11 (68.8%)	5 (31.2%)
Chest X-ray	19 (5.2%)	13 (68.4%)	6 (31.5%)
CT brain scan	33 (9.0%)	28 (84.8%)	5 (15.2%)
Overall outcome at discharge			
Good	265 (73.0%)	53 (20.0%)	212 (80.0%)
Poor	98 (27.0%)	58 (59.2%)	40 (40.8%)

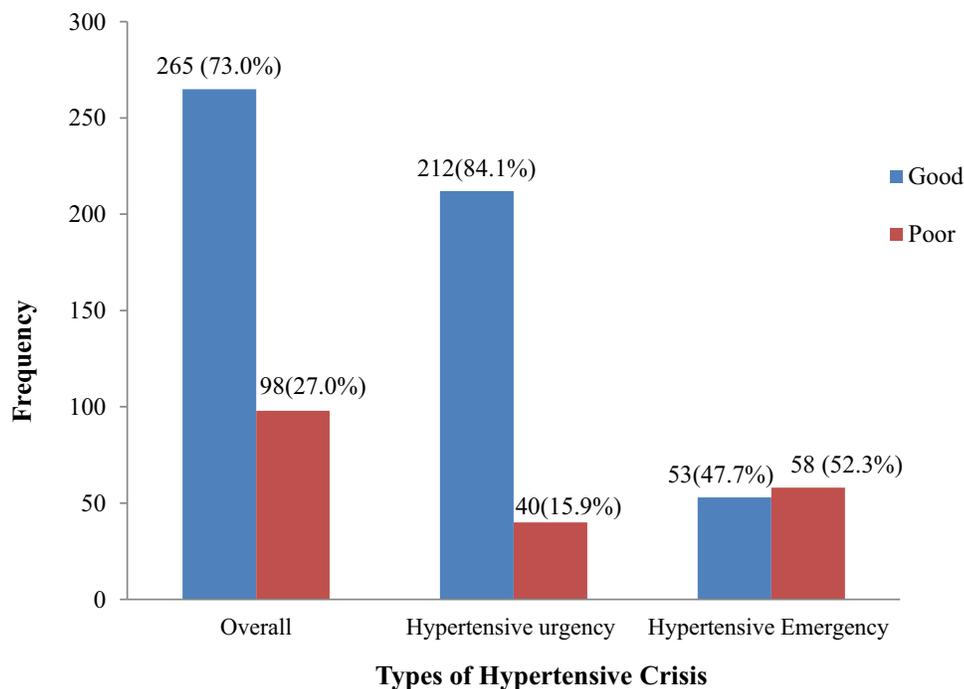
The participants who were non-compliant to their treatment were 2.7-times more likely to have a poor treatment outcome of hypertensive crisis compared with their counterparts (Table 4).

## Discussion

This study provides information on treatment, outcome, and its associated factors among patients admitted with hypertensive crisis in the emergency departments of HFCSH and JGH.

Among 363 hypertensive crisis cases, hypertensive urgency (69.4%) was more common than hypertensive emergency. Comparable findings were reported from Thailand, Italy, the USA, and Brazil, with high proportions of hypertensive urgency of 80.5%, 74.5%, 78%, and 60.4%, respectively.<sup>2,7,14,15</sup> However, the current study finding was relatively higher than studies carried out in Tanzania (32%), eastern Sudan (38.3%), and Congo (24.4%).<sup>8,15,16</sup> Different sample sizes and variations in the study setting could be the plausible causes of this disparity. Among patients presented with a hypertensive crisis, 65.6% of them were male. This high percentage of males were also present in hypertensive urgency, which is inconsistent with study reports from other regions of the world that reported a higher proportion of females than males.<sup>2,17–19</sup> This variation might be due to differences in baseline sociodemographic characteristics of study participants.

In the current study, approximately two-thirds of hypertensive crisis patients had a history of pre-existing hypertension and this finding is in line with the study reported from Thailand.<sup>20</sup> A high proportion of patients with hypertensive urgency had a previous history of hypertension than those with hypertensive emergency, which differs from a previous



**Figure 1** Treatment outcome of hypertensive crisis patients at discharge, Public Hospital, Harar, Ethiopia, 2022.

study conducted in Ayder Comprehensive Specialized Hospital.<sup>6</sup> This disparity could be due to the non-compliance problem of patients to medication and lifestyle modification.

The percentage of non-compliance among patients in hypertensive crisis, especially in cases of hypertensive urgency, was high in prior research and comparable to this study's results (37.7%).<sup>21-23</sup> In line with previous research' findings, non-compliance with therapy was found to be substantially related to a poor treatment outcome for hypertensive

**Table 4** Multivariate Analysis of Factors Associated with Poor Treatment Outcome of Hypertensive Crisis at HFCSH and JGH, Harar, Ethiopia, 2022 admission

Variables	Treatment Outcome		COR (95% CI)	AOR (95% CI)	P-value
	Good (%)	Poor (%)			
Sex					
Female	106 (84.8)	19 (15.2)	2.8 (1.6–4.8)	3.4 (1.7–7.9)	<b>0.01*</b>
Male	159 (66.8)	79 (33.2)			
Residence					
Rural	86 (83.5)	17 (16.5)	2.3 (1.3–4.1)	2.4 (2.7–5.1)	<b>0.03*</b>
Urban	179 (68.8)	81 (31.2)			
History of previous admission					
Yes	178 (70.6)	74 (29.4)	0.7 (0.4–1.1)	0.6 (0.3–1.7)	0.25
No	87 (78.4)	24 (21.6)			
Antihypertensive treatment before admission					
No	81 (65.3)	43 (34.7)	0.9 (0.6–1.6)	0.5 (0.2–0.9)	<b>0.02*</b>
Yes	164 (68.6)	75 (31.4)			
Treatment regimen before admission					
Monotherapy	66 (52.4)	60 (47.6)	0.6 (0.3–0.9)	1.3 (0.7–1.8)	0.45
Combination therapy	75 (66.4)	38 (33.6)			

(Continued)

**Table 4** (Continued).

Variables	Treatment Outcome		COR (95% CI)	AOR (95% CI)	P-value
	Good (%)	Poor (%)			
Compliance to treatment					
Yes	76 (51)	73 (49)	1	1	1
No	65 (72.2)	25 (27.8)	2.5 (1.2–3.2)	2.7 (1.4–3.5)	<b>0.02*</b>
Emergency drug administered during admission					
Captopril	212 (83.1)	43 (16.9)	5.1 (2.2–6.3)	5.6 (2.4–7.9)	<b>0.01*</b>
Hydralazine	53 (49.0)	55 (50.9)	1	1	1

Note: \*Statistically significant.

Abbreviations: COR, Crude Odd Ratio; AOR, Adjusted Odd Ratio.

crisis.<sup>12,24–26</sup> Compliance to treatment is the most important issue in order to improve blood pressure control and minimize hypertensive crisis associated morbidity and mortality.

In the present study, the majority (65.8%) of the patients had a history of hypertension treatment before admission with hypertensive crisis, which is similar with the previous study reported from northern part of Ethiopia. However, there is a difference in the utilized antihypertensive medications before admission.<sup>12</sup> In the current study, the utilized antihypertensive medications include: diuretics, calcium channel blockers, angiotensin-converting enzyme inhibitors, calcium channel blockers with diuretics, and diuretics with angiotensin-converting enzyme inhibitor. The discrepancy might be due to variations in the drug availability and presence of comorbidity among study participants. In this study, the most potent intravenous medication utilized for dropping blood pressure was hydralazine, which differ from a study conducted in Northeastern Thailand, where it was sodium nitroprusside.<sup>20</sup> The plausible reason could be the difference in the availability of drugs.

In the current study, the most common target organ damage results were acute renal failure and ischemic stroke. However, acute coronary syndrome, left ventricular heart failure, cerebral infarction, pulmonary edema, and hypertensive encephalopathy were the most frequent consequences of hypertensive crisis documented in earlier studies carried out in Bahrain and Italy.<sup>27,28</sup> This difference might be due to variety in health settings.

In this study, the magnitude of poor treatment outcome was high, which is similar to a previous report.<sup>29</sup> The presence of acute end organ damage is a major poor prognostic indicator in hypertensive crisis.<sup>31</sup> Patients presenting with a hypertensive crisis need the appropriate evaluation, medical regimen, and discharge instructions proposed by the updated guidelines.<sup>3</sup> The present study found that all hypertensive crisis patients who died in the hospital were due to hypertensive emergency, which is in line with a study conducted at University of Gondar Specialized Hospital, northwest Ethiopia.<sup>12</sup> However, the in-hospital mortality among patients with hypertensive emergency was lower than the study conducted in the Emergency Department (ED) of Muhimbili National Hospital.<sup>8</sup> The probable explanation for difference is most patients in the study conducted in the Emergency Department (ED) of Muhimbili National Hospital did not receive the recommended ED management of their hypertension. The use of intravenous antihypertensive medication in acute management of hypertensive emergency is recommended as standard treatment.<sup>32–34</sup>

Regarding factors associated with hypertensive crisis, this study revealed that female patients were 3.4-times more likely to have poor treatment outcome of hypertensive crisis than male patients (95% CI=1.7–7.9). A similar finding was reported from a study conducted in Switzerland, which showed that being female was significantly associated with poor treatment outcome of hypertensive crisis.<sup>24</sup> The likely explanation could be that those female patients may be less aware of cardiovascular complications linked to hypertension.

Furthermore, the present study found that the odds of poor treatment outcome of hypertensive crisis were 2.4-times higher among patients who lived in rural areas as compared to those who lived in the urban areas. The possible explanation might be hypertensive patients who lived in rural areas might not arrive promptly after experiencing hypertensive crisis.

## Limitation of This Study

Due to the absence of a computerized system, the information in the records was entered manually, and sometimes it was difficult to read, providing few independent variables to the study, and this fact may also have an influence on the results. Due to the retrospective nature of the study, behavioral factors reported directly from the patient were not included. In this study factors associated with treatment outcome of hypertensive crisis were assessed using a cross-sectional design, which might not show causal relationships with potential factors.

## Conclusion

Acute renal failure and ischemic stroke are the frequent types of end-organ damage in hypertensive emergency. The proportion of hypertensive urgency was found to account for a large percentage of patients. The magnitude of poor treatment outcome of hypertensive crisis was high. Sex, residence, non-compliance to their treatment and emergency drug administered during admission were significantly associated with poor treatment outcome of hypertensive crisis. The health professional should put great emphasis on the emergency drug administered during admission to achieve the desired outcome.

## Ethical Consideration

An ethical clearance letter was obtained from Haramaya University, College of Health and Medical Sciences, Institutional Health Research Ethics Review Committee (IHRERC) under reference number IHRERC/019/2022. Haramaya University, College of Medical and Health Sciences IHRERC allowed the review of patients' medical records with justifiable reason (for research purposes) regardless of patients' consent. The head administrator of HFCSH and JGH provided consent on behalf of the patients. In addition, a formal permission letter to conduct the data collection was obtained from the head administrator of HFCSH and JGH. The names and unique identification numbers of patients were kept confidential and anonymous in compliance with the Declaration of Helsinki.

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## Author Contributions

All authors made a significant contribution to the work in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare that they have no competing interests in this work.

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