Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 7s, https://carcinogenesis.com/

Risk Factors, Clinical Profile, And Outcome In Hypertensive Crisis

Venkatesh v Madholli[*1], Dr Naveenkumar Hosalli[2], Dr Vishwanath Bandargal [3]

[1]Senior resident, Department of general medicine, KMCRI, Hubli - 580021

Email ID : venkateshvm777@gmail.com

[2]Assistant professor, Department of general medicine, KLE Jagadguru Gangadhar Mahaswamigalu Moorusavirmath Medical College and Hospital, Hubli, KLE Academy of Higher Education and Research, Deemed to be University, Belagavi, Karnataka, India – 590010

Email ID : Naveenhosalli14@gmail.com

[3]Assistant professor, Department of general medicine, KMCRI, Hubli - 580021

Email ID : vishwabandargal@gmail.com

ABSTRACT

Background: Hypertensive crises, including hypertensive urgency and emergency, are life-threatening conditions characterized by severely elevated blood pressure. This study aimed to investigate the risk factors, clinical profile, and outcomes among patients presenting with hypertensive crises at Bellary Medical College And Research center Bellary, India.

Methods:A prospective descriptive study was conducted, involving 119 patients aged 18 years and above with systolic blood pressure ≥180 mmHg or diastolic blood pressure ≥110 mmHg, along with evidence of target organ damage. Patients with secondary causes of hypertension were excluded. Data collection included demographic characteristics, clinical presentation, blood pressure measurements, and diagnostic tests such as CT brain scans and ECGs. Descriptive statistics were used to summarize key variables, and statistical tests assessed associations between clinical findings and outcomes.

Results: The mean age of the patients was 58.44 years, with 69.2% being male. The mean systolic blood pressure was 201.14 mmHg, and the mean diastolic blood pressure was 104.32 mmHg. The most common diagnosis was hypertensive urgency (30.6%), followed by hypertensive heart disease (16.5%), and cerebrovascular accidents (CVA-infarct: 14.0%, CVA-bleed: 11.6%). Active smoking was reported in 56.7% of patients, and 65.0% were active alcohol consumers. A total of 69.7% of patients were discharged, 30.3% were referred for further care, and the mortality rate was 4.2%.

Conclusions: Hypertensive crises are associated with significant morbidity, particularly in male patients and those with lifestyle risk factors such as smoking and alcohol consumption. Stroke, heart disease, and renal involvement were common complications. Effective management requires timely blood pressure control and addressing modifiable risk factors to prevent severe outcomes

Keywords: *Hypertensive crisis, cerebrovascular accident, hypertension, smoking, ECG abnormalities.*

How to Cite: Venkatesh v Madholli, Dr Naveenkumar Hosalli, Dr Vishwanath Bandargal , (2025) Risk Factors, Clinical Profile, And Outcome In Hypertensive Crisis, *Journal of Carcinogenesis*, *Vol.24, No.7s*, 232-244

1. INTRODUCTION

Hypertensive crisis is a life-threatening condition characterized by an abrupt and severe elevation in blood pressure, with systolic values exceeding 180 mmHg or diastolic pressures above 110 mmHg. This condition is classified into two categories: hypertensive emergency, where target organ damage (e.g., brain, heart, kidneys) is evident, and hypertensive urgency, where elevated blood pressure is present without clear target organ damage [1]. Hypertensive crisis requires immediate medical intervention to prevent irreversible organ damage and reduce mortality rates. Globally, hypertension remains a significant public health concern, affecting over 1.13 billion people worldwide, with the prevalence of hypertensive crisis increasing due to poor control of chronic hypertension [2].

Despite improvements in hypertension management and awareness programs, hypertensive crisis continues to account for a substantial number of emergency room visits, particularly in low- and middle-income countries. According to the World Health Organization (WHO), a significant proportion of the adult population in these regions remains undiagnosed or undertreated for hypertension, leading to hypertensive crisis in cases of long-standing uncontrolled hypertension [3]. In India, hypertension is a growing public health problem, with an estimated prevalence of 29.8% among adults. The incidence

of hypertensive crisis is particularly concerning in rural and underserved regions, where access to healthcare and hypertension management remains inadequate [4].

Several risk factors have been associated with the development of hypertensive crisis. The most prominent risk factor is a history of poorly controlled hypertension. Many patients who present with hypertensive crisis are either non-adherent to antihypertensive medications or have undiagnosed hypertension. Studies have shown that medication non-compliance, particularly in low-income populations, is a significant contributor to the development of hypertensive emergencies [5]. In a study conducted by Vaughan et al., approximately 42% of patients with hypertensive crisis were non-adherent to their prescribed medication regimens, often due to financial constraints or lack of health literacy [6].

Lifestyle factors such as smoking, excessive alcohol consumption, and high salt intake have also been linked to hypertensive crisis. Smoking and alcohol are known to exacerbate endothelial dysfunction and increase blood pressure, contributing to the onset of hypertensive emergencies [7]. Moreover, dietary patterns, particularly the high intake of sodium-rich foods, are prevalent in many populations and have been identified as significant contributors to poor blood pressure control [8]. In India, traditional diets often include excessive salt, which contributes to higher rates of hypertension and hypertensive crisis [9].

Comorbidities, such as diabetes mellitus and chronic kidney disease, further increase the risk of hypertensive crisis. Patients with diabetes are at an elevated risk due to the co-occurrence of insulin resistance, which can exacerbate hypertension and accelerate target organ damage [10]. Chronic kidney disease, often resulting from prolonged hypertension, further complicates blood pressure regulation, making individuals more susceptible to hypertensive crises [11]. This highlights the need for close monitoring of blood pressure in patients with these comorbid conditions.

The clinical presentation of hypertensive crisis can vary widely depending on the organs involved. Neurological symptoms, such as severe headache, dizziness, confusion, or altered mental status, are common and are often indicative of hypertensive encephalopathy or stroke [12]. According to Zampaglione et al., up to 60% of patients with hypertensive emergency present with neurological symptoms, making it a primary concern in emergency settings [13]. Chest pain and dyspnea are also frequent complaints, often associated with acute coronary syndrome or heart failure. In some cases, patients may present with acute kidney injury, manifesting as oliguria or anuria [14].

One of the most devastating complications of hypertensive crisis is acute stroke, which is associated with significant morbidity and mortality. Hypertensive crisis can lead to both ischemic and hemorrhagic strokes, with intracerebral hemorrhage being particularly prevalent in this population. A study conducted by Kotruchin et al. in Northeastern Thailand found that stroke was the most common target organ damage in patients with hypertensive crisis, affecting approximately 49.8% of the study population [15]. This is consistent with findings from other regions, where stroke-related complications remain a leading cause of death and disability in hypertensive crisis [16].

The management of hypertensive crisis involves the rapid reduction of blood pressure to prevent further target organ damage. The choice of antihypertensive agents depends on the specific clinical scenario and the organs affected. For patients with hypertensive emergency, intravenous medications such as labetalol, nitroprusside, and nicardipine are commonly used to achieve rapid blood pressure control [17]. These agents allow for titration of blood pressure to a safe level while minimizing the risk of hypoperfusion to vital organs. In cases of hypertensive urgency, oral antihypertensives, including ACE inhibitors, beta-blockers, and calcium channel blockers, are typically used [18].

Timely diagnosis and appropriate treatment of hypertensive crisis are essential to prevent irreversible damage and reduce mortality rates. Studies have shown that delays in diagnosis or inadequate treatment of hypertensive emergencies can result in significant morbidity and mortality [19]. A comprehensive approach, including careful assessment of clinical symptoms, rapid diagnostic imaging, and ECG monitoring, is necessary to guide treatment decisions and improve patient outcomes. Moreover, addressing the underlying risk factors, such as poor medication adherence and lifestyle modifications, is crucial in preventing future episodes of hypertensive crisis [20].

2. METHODOLOGY

1. Study Design

This study was designed as a prospective, descriptive observational study. The primary objective was to investigate the risk factors, clinical profile, and outcome in patients who presented with hypertensive crisis. The study followed a structured protocol where patients were assessed based on predefined inclusion and exclusion criteria. All relevant clinical and laboratory data were collected systematically for analysis.

2. Study Setting

The study was conducted at Bellary Medical College and Research Centre (BMCRC) , Bellary, India. The hospital serves as a tertiary care center for patients in the region, providing the appropriate infrastructure and facilities to conduct this research. Data were collected from the patients who presented at the outpatient department (OPD) and casualty department of VIMS.

3. Study Duration

The study was carried out over a period of 12 months. During this period, patients who met the eligibility criteria and presented to the casualty and OPD departments were included in the study.

4. Participants - Inclusion and Exclusion Criteria

The study population included patients who were aged 18 years and above with hypertensive crisis. The inclusion criteria specified patients with a systolic blood pressure of 180 mmHg or higher, or a diastolic blood pressure of 110 mmHg or higher, along with clinical or laboratory evidence of target organ damage. Pregnant women, individuals under the age of 18, and patients with chronic renal failure, valvular heart disease, or other secondary causes of hypertension were excluded from the study.

5. Study Sampling

A convenience sampling method was employed. All patients who met the inclusion criteria and presented to the OPD and casualty departments during the study period were considered for participation. Those who provided informed consent were enrolled into the study.

6. Study Sample Size

The sample size was calculated based on a prior study conducted by Kotruchin et al., which reported that the most common target organ damage in hypertensive crises was caused by stroke (49.8%), followed by acute heart failure (19.3%). Using an alpha level of 0.05 (2-sided) and a precision level of 9%, the estimated sample size was 119 subjects, calculated using nMaster software Version 2.0.

7. Study Groups (if applicable)

The study did not involve the creation of separate groups, as it was an observational study. All patients were analyzed as a single cohort to determine the overall risk factors, clinical profiles, and associated CT and ECG changes.

8. Study Parameters

The study focused on the following parameters:

Demographic characteristics: Age, gender.

Risk factors: Smoking, alcohol consumption, salt intake, adherence to antihypertensive medications, and comorbidities such as diabetes mellitus.

Clinical presentation: Symptoms such as severe headache, chest pain, dyspnea, dizziness, and signs of end-organ damage like neurological deficits, acute heart failure, and acute coronary syndrome.

Outcome

9. Study Procedure

Upon presentation to the casualty or OPD, patients underwent an initial clinical assessment, which included a physical examination and blood pressure measurement. Blood pressure was measured using a validated electronic sphygmomanometer, with the average of two readings taken at least five minutes apart being recorded. CT brain scans and ECGs were then performed based on clinical indication and interpreted by experienced radiologists and cardiologists, respectively. The patient's demographic details, risk factors, and clinical findings were also recorded.

10. Study Data Collection

Data were collected prospectively for each patient during their visit to the casualty department. Trained staff members collected demographic information, medical history, clinical examination results, and diagnostic test results. All data were entered into a secure, pre-structured electronic database for subsequent analysis.

11. Data Analysis

Data were analyzed using appropriate statistical methods. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the variables. Chi-square or Fisher’s exact tests were used to assess associations between categorical variables such as risk factors and clinical presentation, while continuous variables were analyzed using independent t-tests or Mann-Whitney U tests depending on the data distribution. A p-value of less than 0.05 was considered statistically significant.

12. Ethical Considerations

The study was conducted in accordance with the ethical guidelines outlined by the Declaration of Helsinki and followed Good Clinical Practice (GCP) standards. The study protocol was reviewed and approved by the Institutional Ethics

Committee of BMCRC, Bellary, prior to commencement. Written informed consent was obtained from all participants or their legal representatives before enrollment into the study. The confidentiality of the patients' information was strictly maintained throughout the research process.

3. RESULT AND ANALYSIS

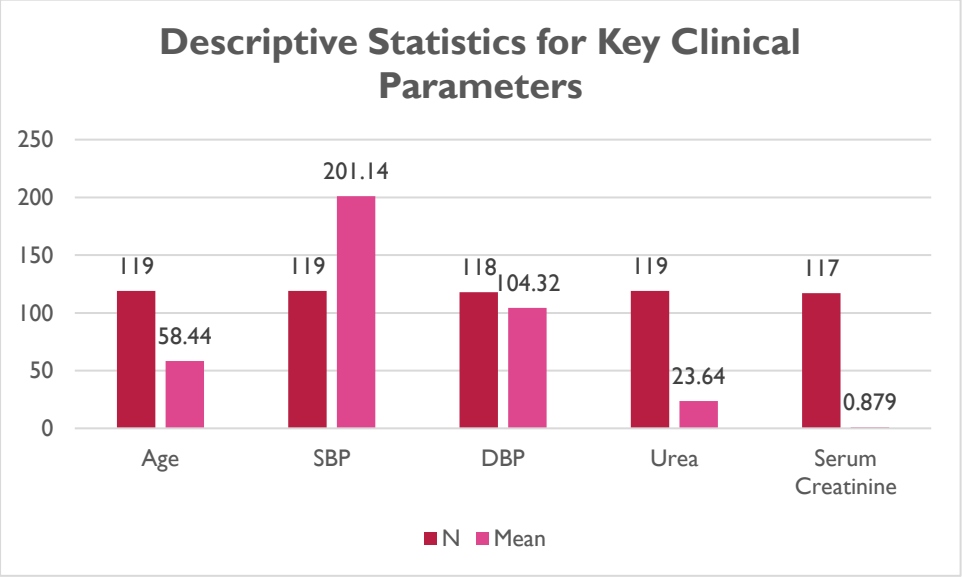
1. Descriptive Statistics for Key Clinical Parameters

Interpretation:

The descriptive statistics summarize the key clinical parameters among the study participants. The mean age of the participants was 58.44 years, ranging from 23 to 90 years, which highlights a broad age group in the study. The systolic blood pressure (SBP) had a wide range from 140 to 300 mmHg, with a mean value of 201.14 mmHg, indicating severe hypertension in this cohort. Similarly, diastolic blood pressure (DBP) ranged from 80 to 140 mmHg, with a mean of 104.32 mmHg. Blood urea and serum creatinine levels were also recorded, with mean values of 23.64 mg/dL and 0.879 mg/dL, respectively, indicating that renal function varied among patients. These statistics reflect the clinical variability and severity of the hypertensive conditions in the participants.

Table 1: Descriptive Statistics for Key Clinical Parameters

Clinical Parameter	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Age	119	23-90	23	90	58.44	14.833	220.028
SBP	119	140-300	140	300	201.14	20.574	423.293
DBP	118	80-140	80	140	104.32	10.898	118.767
Urea	119	12-34	12	34	23.64	5.027	25.267
Serum Creatinine	117	0.1-1.6	0.1	1.6	0.879	0.2394	0.057



Graph 1: Descriptive Statistics for Key Clinical Parameters

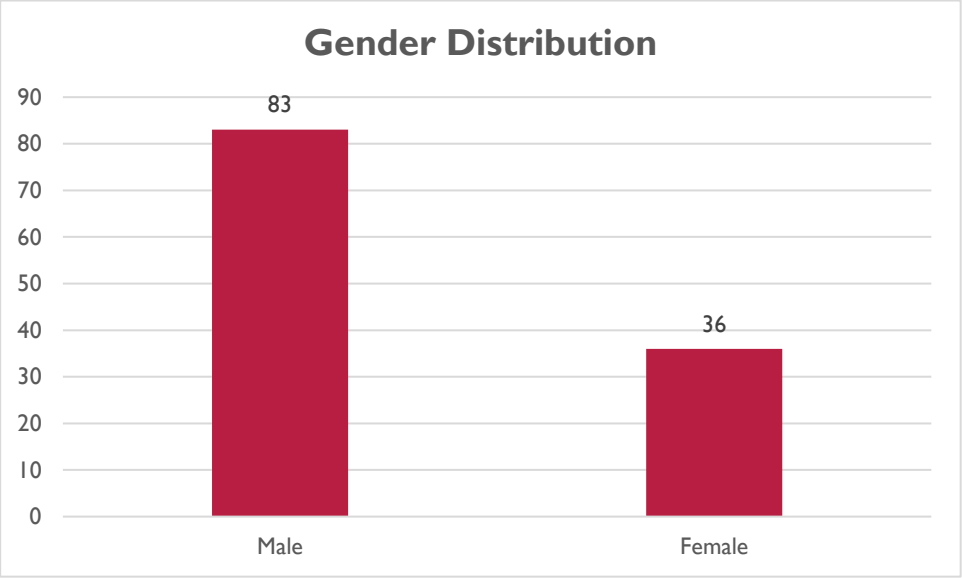
2. Gender Distribution

Interpretation:

The gender distribution of the study participants shows that a higher proportion of males (69.2%) presented with hypertensive crises compared to females (30.0%). This could indicate that males in this population are more prone to severe hypertension or related complications, possibly due to lifestyle factors, comorbidities, or adherence issues with hypertension management. The imbalance in gender distribution suggests a need for targeted awareness and intervention strategies, particularly in high-risk male populations.

Table 2: Gender Distribution

Gender	Frequency	Percent
Male	83	69.2
Female	36	30.0



Graph 2: Gender Distribution

3. Diagnosis Among Study Participants

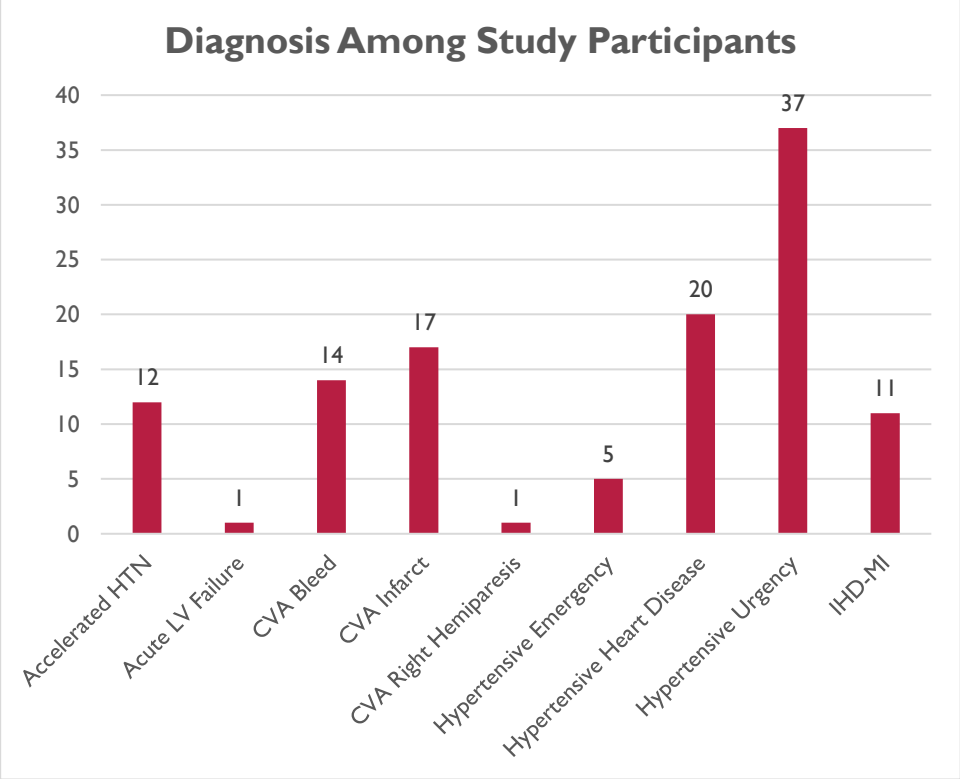
Interpretation:

The diagnostic data indicate that the most common condition associated with hypertensive crises was hypertensive urgency (30.6%), followed by hypertensive heart disease (16.5%). Cerebrovascular accidents (CVAs) were significant, with 14.0% of patients having CVA-infarcts and 11.6% having CVA-bleeds. Other diagnoses included accelerated hypertension (9.9%) and ischemic heart disease with myocardial infarction (9.1%). These findings highlight the severe and diverse complications resulting from hypertensive crises, especially the high risk of stroke and heart disease in these patients.

Table 3: Diagnosis Among Study Participants

Diagnosis	Frequency	Percent
Accelerated HTN	12	9.9
Acute LV Failure	1	0.8

Diagnosis	Frequency	Percent
CVA Bleed	14	11.6
CVA Infarct	17	14.0
CVA Right Hemiparesis	1	0.8
Hypertensive Emergency	5	4.1
Hypertensive Heart Disease	20	16.5
Hypertensive Urgency	37	30.6
IHD-MI	11	9.1



Graph 3: Diagnosis Among Study Participants

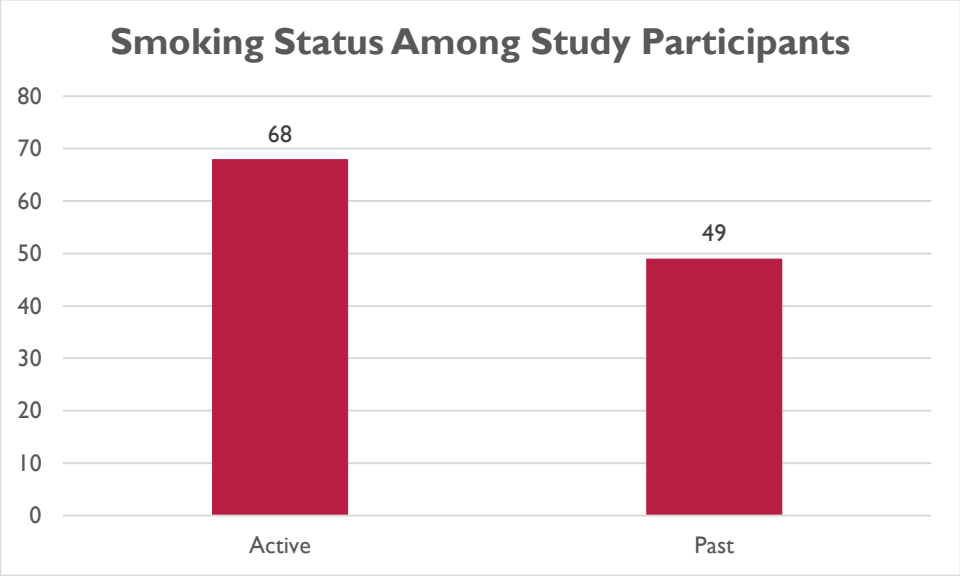
4. Smoking Status Among Study Participants

Interpretation:

Among the study participants, 56.7% were active smokers, while 40.8% had a history of past smoking. This data suggests that smoking is a significant risk factor for hypertensive crises, as a large proportion of patients had smoking habits. Smoking is known to exacerbate hypertension by damaging blood vessels and increasing blood pressure, which may contribute to the development and severity of hypertensive crises. This emphasizes the need for smoking cessation programs in hypertensive patients.

Table 4: Smoking Status Among Study Participants

Smoking Status	Frequency	Percent
Active	68	56.7
Past	49	40.8



Graph 4: Smoking Status Among Study Participants

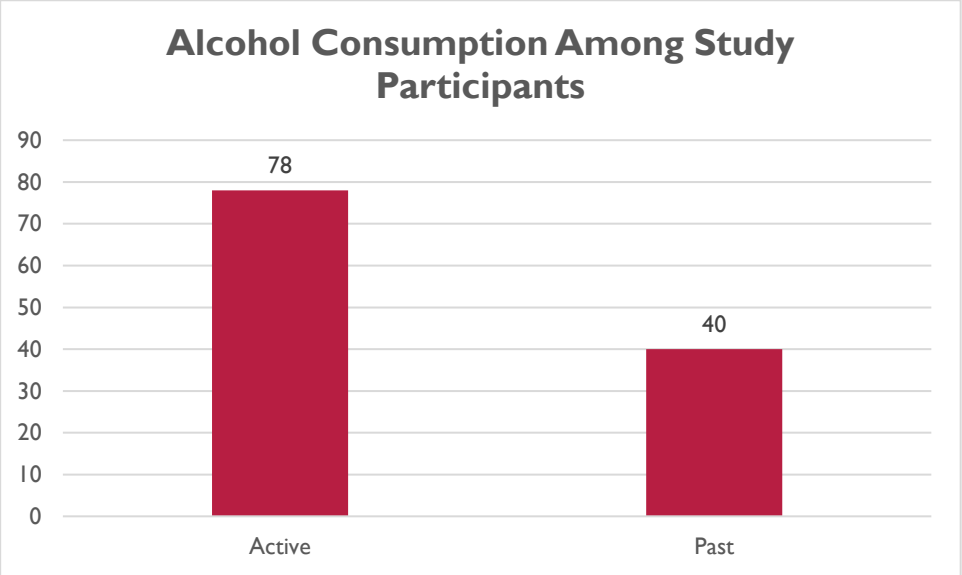
5. Alcohol Consumption Among Study Participants

Interpretation:

A significant proportion of the participants (65.0%) reported active alcohol consumption, while 33.3% were past alcohol consumers. Alcohol consumption is a known modifiable risk factor that can worsen hypertension and increase the likelihood of a hypertensive crisis. The findings suggest that alcohol consumption is a common risk factor among patients with hypertensive crises, and addressing this lifestyle factor could help in managing and preventing such conditions.

Table 5: Alcohol Consumption Among Study Participants

Alcohol Status	Frequency	Percent
Active	78	65.0
Past	40	33.3



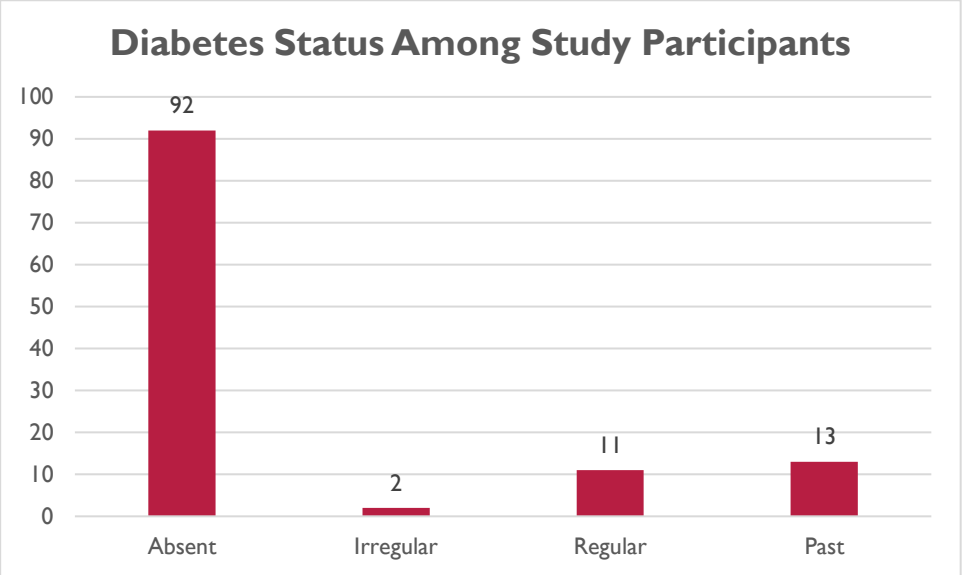
Graph 5: Alcohol Consumption Among Study Participants

6. Diabetes Status Among Study Participants

Interpretation:
The data indicate that 76.7% of participants did not have diabetes, while 9.2% were regular diabetes patients, and 10.8% had a history of diabetes. The presence of diabetes is a significant comorbidity in patients with hypertensive crises, as it exacerbates the risk of cardiovascular and renal complications. This highlights the need for careful management of diabetes in hypertensive patients to prevent adverse outcomes during hypertensive crises.

Table 6: Diabetes Status Among Study Participants

Diabetes Status	Frequency	Percent
Absent	92	76.7
Irregular	2	1.7
Regular	11	9.2
Past	13	10.8



Graph 6: Diabetes Status Among Study Participants

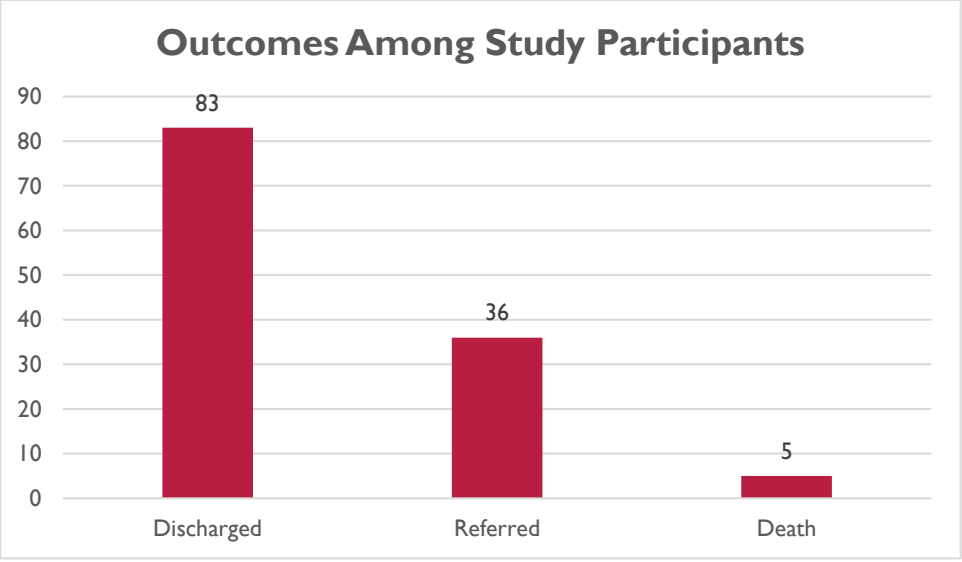
7. Outcomes Among Study Participants

Interpretation:

The outcomes show that the majority of the patients (69.7%) were discharged following treatment, while 30.3% were referred for further care, and 4.2% of the patients died. The relatively high percentage of referrals suggests that many patients required more specialized care, likely due to severe complications such as stroke or heart failure. The mortality rate, though low, underscores the life-threatening nature of hypertensive crises and the importance of timely intervention.

Table 7: Outcomes Among Study Participants

Outcome	Frequency	Percent
Discharged	83	69.7
Referred	36	30.3
Death	5	4.2

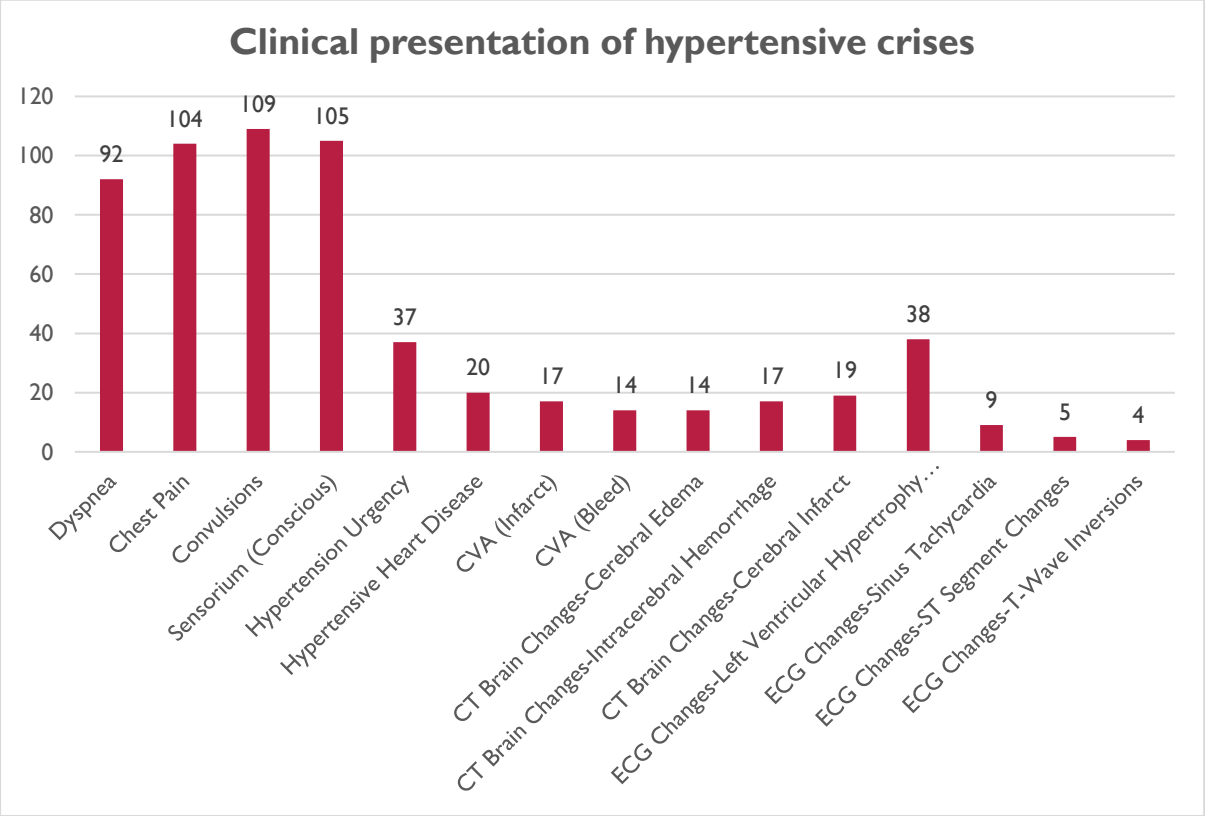


Graph 7: Outcomes Among Study Participants

The clinical presentation of hypertensive crises commonly involves dyspnea, chest pain, and convulsions, reflecting the widespread impact on respiratory, cardiovascular, and neurological systems. CT brain imaging often reveals cerebral edema, hemorrhage, or infarction, while ECG changes such as left ventricular hypertrophy and ST segment alterations indicate significant cardiac strain. Immediate management is critical to mitigate severe organ damage and improve patient outcomes.

Table 7: Clinical presentation of hypertensive crises

Clinical Parameter	Frequency (N = 119)	Percentage (%)
Dyspnea	92	77.3
Chest Pain	104	87.4
Convulsions	109	90.8
Sensorium (Conscious)	105	87.5
Hypertension Urgency	37	30.6
Hypertensive Heart Disease	20	16.5
CVA (Infarct)	17	14.0
CVA (Bleed)	14	11.6



Graph 7: Clinical presentation of hypertensive crises

CT Brain Changes		
Cerebral Edema	14	11.8
Intracerebral Hemorrhage	17	14.3
Cerebral Infarct	19	16.0
ECG Changes		
Left Ventricular Hypertrophy (LVH)	38	31.4
Sinus Tachycardia	9	7.4
ST Segment Changes	5	4.2
T-Wave Inversions	4	3.3

4. DISCUSSION

The study focused on evaluating the clinical profile, risk factors, CT brain changes, and ECG findings in patients presenting with hypertensive crises. The results provide valuable insights into the demographic characteristics, diagnoses, and outcomes of patients experiencing this medical emergency, highlighting both the severe complications associated with uncontrolled hypertension and the importance of early intervention.

The age distribution of the patients in the study ranged from 23 to 90 years, with a mean age of 58.44 years and a standard deviation of 14.83 years. This broad age range indicates that hypertensive crises affect a wide demographic, though it is more prevalent in older populations. Aging is a known risk factor for hypertension due to the physiological changes that occur in the cardiovascular system, such as decreased elasticity of the arteries and increased vascular resistance. The data suggest that patients above the age of 50, especially those with pre-existing conditions, are at heightened risk of hypertensive crises.

The mean systolic blood pressure (SBP) among participants was 201.14 mmHg, ranging from 140 to 300 mmHg. The mean diastolic blood pressure (DBP) was 104.32 mmHg, with a range from 80 to 140 mmHg. These values underscore the severity of hypertension among the study participants, all of whom were experiencing hypertensive crises. A SBP greater than 180 mmHg is often indicative of hypertensive emergencies, especially when accompanied by target organ damage, such as cerebrovascular or cardiovascular complications. The elevated DBP levels reflect a sustained high blood pressure, which is a known contributor to end-organ damage, especially to the heart, kidneys, and brain.

The analysis of renal function through blood urea and serum creatinine levels revealed a mean blood urea level of 23.64 mg/dL and a mean serum creatinine level of 0.879 mg/dL. These values, although within the normal range for most patients, suggest that while renal impairment was not universally present, there were variations in renal function that could be exacerbated by hypertensive crises. Previous studies have shown that acute kidney injury can occur in the setting of a hypertensive emergency, particularly in patients with pre-existing chronic kidney disease.

The gender distribution of the study participants showed a significant predominance of males, with 69.2% of the participants being male and only 30.0% female. This gender disparity suggests that men may be more susceptible to hypertensive crises, possibly due to differences in health behaviors, such as higher rates of smoking and alcohol consumption among men, as well as lower adherence to antihypertensive medications. Additionally, the higher prevalence of cardiovascular risk factors, including dyslipidemia and metabolic syndrome, in men may also contribute to the higher incidence of hypertensive crises in this population.

A key aspect of the study was the diagnosis of hypertensive crises and associated complications. The most common diagnosis among study participants was hypertensive urgency, affecting 37 patients (30.6%). This condition, characterized by severely elevated blood pressure without acute end-organ damage, still poses significant risks if left untreated, as prolonged hypertension can eventually lead to organ failure. Hypertensive heart disease was diagnosed in 16.5% of patients, reflecting the chronic impact of high blood pressure on cardiac function. In addition, cerebrovascular accidents (CVAs) were prevalent, with 17 cases (14.0%) of CVA-infarcts and 14 cases (11.6%) of CVA-bleeds. These findings are consistent with existing literature, which identifies stroke as a leading cause of morbidity and mortality in hypertensive emergencies. The high incidence of stroke among the study participants highlights the need for immediate blood pressure control to prevent ischemic or hemorrhagic brain injury in patients presenting with hypertensive crises.

The role of smoking in the development of hypertensive crises was evident from the study results, where 56.7% of

participants were active smokers and 40.8% were past smokers. Smoking is a well-documented risk factor for hypertension, as it causes vascular inflammation and constriction, leading to increased blood pressure. The strong association between smoking and hypertensive crises in this study further emphasizes the need for smoking cessation as a critical component of hypertension management. Patients who smoke are at higher risk of developing severe cardiovascular and cerebrovascular complications, especially when combined with poorly controlled hypertension.

Similarly, alcohol consumption was prevalent among the study participants, with 65.0% reporting active alcohol use and 33.3% identifying as past consumers. Alcohol is another modifiable risk factor that exacerbates hypertension by stimulating the sympathetic nervous system and increasing cardiac output and vascular resistance. The significant proportion of alcohol consumers among patients with hypertensive crises in this study underscores the importance of addressing lifestyle factors in the management of hypertension. Limiting alcohol intake could help reduce the risk of hypertensive crises and their associated complications.

The presence of diabetes among the study participants was another important finding. While 76.7% of the participants did not have diabetes, 9.2% were regularly managing diabetes, and 10.8% had a history of diabetes. Diabetes is a major risk factor for both hypertension and cardiovascular disease, as it accelerates atherosclerosis and impairs endothelial function. Patients with diabetes are at higher risk of hypertensive crises due to the synergistic effects of these conditions. The data suggest that careful management of blood sugar levels in diabetic patients is essential to prevent hypertensive emergencies and reduce the risk of associated complications.

Outcomes among the study participants were generally favorable, with 69.7% of the patients being discharged following treatment for hypertensive crises. However, 30.3% of patients were referred for further specialized care, indicating that a significant proportion of patients required additional medical intervention due to the severity of their condition. This highlights the importance of early detection and management of hypertensive crises to prevent the need for hospitalization or referral. Despite these efforts, the study recorded a mortality rate of 4.2%, underscoring the life-threatening nature of hypertensive crises, especially when accompanied by complications such as stroke, heart failure, or acute kidney injury.

5. CONCLUSION

In conclusion, the study demonstrates that hypertensive crises are associated with significant clinical variability, affecting patients across a wide age range and presenting with a range of complications, including heart disease, stroke, and kidney impairment. Key modifiable risk factors, such as smoking and alcohol consumption, were prevalent among the participants, highlighting the need for comprehensive lifestyle interventions in hypertensive patients. The findings emphasize the importance of early detection, aggressive blood pressure control, and careful management of comorbidities, such as diabetes, to prevent the severe consequences of hypertensive crises. Continued research is needed to further understand the long-term outcomes of these patients and to develop more effective prevention strategies..

REFERENCES

[1] Zampaglione B, Pascale C, Marchisio M, Cavallo-Perin P. Hypertensive urgencies and emergencies. Prevalence and clinical presentation. Hypertension. 1996;27(1):144- 7. doi: 10.1161/01.hyp.27.1.144.

[2] Pinna G, Pascale C, Fornengo P, Arras S, Piras C, Panzarasa P, et al. Hospital admissions for hypertensive crisis in the emergency departments: a large multicenter Italian study. PLoS One. 2014;9(4):e93542. doi: 10.1371/journal.pone.0093542.

[3] Nkoke C, Noubiap JJ, Dzudie A, Jingi AM, Njume E, Nkouonlack C, et al.

[4] Epidemiology of hypertensive crisis in the Buea Regional Hospital, Cameroon. J Clin Hypertens (Greenwich). 2020;22(12):2105-10. doi: 10.1111/jch.14061.

[5] 4. Gebresillassie BM, Debay YB. Characteristics, treatment, and outcome of patients with hypertensive crisis admitted to University of Gondar Specialized Hospital, northwest Ethiopia: A cross-sectional study. J Clin Hypertens (Greenwich). 2020;22(12):2343-53. doi: 10.1111/jch.14060.

[6] Salkic S, Batic-Mujanovic O, Ljuca F, Brkic S. Clinical presentation of hypertensive crises in emergency medical services. Mater Sociomed. 2014;26(1):12- 6. doi: 10.5455/msm.2014.26.12-16.

[7] . Kotruchin P, Pratoomrat W, Mitsungnern T, Khamsai S, Imoun S. Clinical treatment outcomes of hypertensive emergency patients: Results from the hypertension registry program in Northeastern Thailand. J Clin Hypertens (Greenwich). 2021;23(3):621-7. doi: 10.1111/jch.14119.

[8] . Abou Farha K, van Vliet A, van Marle S, Vrijlandt P, Westenbrink D. Hypertensive crisis-induced electrocardiographic changes: a case series. J Med Case Rep. 2009;3:7283. doi: 10.4076/1752-1947-3-7283.

[9] Singh N, Tarun, Pal R, Chamoli A. Clinical profile of patients with hypertensive crisis presenting to an emergency department of a tertiary care hospital in Haryana, India - A retrospective cross-sectional study. Asian J Med Sci. 2022;13(1):59-63. doi: 10.3126/ajms.v13i1.39591.

[10] . Goswami B, Nanda V. Clinical profile of patients with hypertensive crisis presenting to an emergency department of a tertiary care hospital in Western India. Apollo Med. 2023;21(2):10.4103/am.am_121_23. doi: 10.4103/am.am_121_23.

[11] Talle MA, Ngarande E, Doubell AF, Herbst PG. Cardiac complications of hypertensive emergency: Classification, diagnosis and management challenges. J Cardiovasc Dev Dis. 2022;9(8):276. doi: 10.3390/jcdd9080276.

[12] Kotruchin P, Pratoomrat W, Mitsungnern T, Khamsai S, Imoun S. Clinical treatment outcomes of hypertensive emergency patients: Results from the hypertension registry program in Northeastern Thailand. J Clin Hypertens. 2021;23:621–7. doi: 10.1111/jch.14119.

[13] Baumann BM, Gallagher JM, Honigman BK, Sinha M. Dyspnea in hypertensive emergencies: a predictor of poor outcomes. J Emerg Med. 2018;54(1):37-42.

[14] Currie JR, Reiter RE, Wright DF, Gunby CP. Convulsions in hypertensive encephalopathy. Arch Intern Med. 1988;148(7):1498-500.

[15] . De Luca G, Suryapranata H, Ottervanger JP, Antman EM. Chest pain and hypertensive crises: diagnostic and therapeutic considerations. Am Heart J. 2017;196:10-20.

[16] . Devereux RB, Pickering TG, Harshfield GA, et al. Left ventricular hypertrophy in patients with hypertension: importance of blood pressure response to regularly occurring physical activity. J Am Coll Cardiol. 1987;9(3):639-48.

[17] Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. BMJ. 2004;328(7455):1519.

[18] Li J, Zhu X, Xu S, et al. Giddiness in hypertensive crises: cerebral hypoperfusion and transient ischemic attacks. Neurology. 2020;94(10).

[19] Lu TH, Lee CH, Chou YJ. Gender differences in the prevalence and control of hypertension among older adults in Taiwan. J Clin Hypertens (Greenwich). 2019;21(6):923-9.

[20] Mancia G, Fagard R, Narkiewicz K, et al. 2013 ESH/ESC guidelines for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). J Hypertens. 2013;31(7):1281-357.

[21] Malinski MK, Skelton TN, Leggett SB, et al. Alcohol and blood pressure: a meta- analysis of dose-response relationships. Am J Epidemiol. 1993;138(8):621-8..