

A Prospective Observational Study of Patients Presenting with Hypertensive Emergencies in Emergency Department

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Abstract

Background: Hypertensive emergencies are characterized by severe elevation of blood pressure with acute target-organ damage and require prompt recognition and management. This study evaluated the demographic profile, clinical presentation, blood pressure characteristics, and spectrum of target-organ damage among patients presenting with hypertensive emergencies.

Methods: This prospective observational study was conducted over 18 months in the Department of Emergency Medicine, L. N. Medical College and J. K. Hospital, Bhopal. Adult patients aged >18 years with systolic blood pressure ≥ 180 mmHg and/or diastolic blood pressure ≥ 110 mmHg together with evidence of acute target-organ damage were enrolled. Demographic, clinical, vital, laboratory, and organ-damage parameters were recorded and analyzed.

Results: A total of 98 patients were included. The mean age was 53.78 years, and 62.2% were male; 57.1% were urban residents. Headache was the most common symptom (65.3%), followed by giddiness and chest pain (50.0% each), nausea/vomiting (35.7%), neurological deficits (24.5%), and dyspnoea (20.4%). Mixed presentation was most frequent (49.0%), followed by neurological presentation (37.8%). Mean systolic and diastolic blood pressures were 203.99 ± 19.43 and 128.86 ± 13.81 mmHg, respectively. Neurological and renal target-organ damage each occurred in 29.6% of patients, cardiovascular damage in 27.6%, and multiple-organ damage in 21.4%. No significant association was observed between age, gender, or blood-pressure categories and specific target-organ damage.

Conclusion: Hypertensive emergencies predominantly affected middle-aged and older adults and showed frequent multisystem involvement. Early comprehensive assessment, particularly neurological, cardiovascular, and renal evaluation, is essential to identify organ injury and guide timely emergency management.

Keywords: Hypertensive Emergency; Target-Organ Damage; Hypertension; Emergency Department; Neurological Involvement; Renal Dysfunction; Cardiovascular Complications.

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Introduction

Hypertension is one of the most prevalent non-communicable diseases worldwide and remains a major contributor to cardiovascular, cerebrovascular, and renal morbidity and mortality [1]. Despite advances in screening and antihypertensive therapy, inadequate blood pressure control continues to be common, particularly in low- and middle-income countries, where limited awareness, inconsistent follow-up, treatment non-adherence, and delayed access to healthcare contribute to preventable complications [2]. At the severe end of this spectrum lies hypertensive emergency, a life-threatening clinical condition characterized by a marked elevation in

blood pressure accompanied by acute target-organ damage [3]. Unlike hypertensive urgency, in which severe blood pressure elevation occurs without ongoing organ injury, hypertensive emergency requires immediate recognition, close monitoring, and carefully controlled blood pressure reduction to prevent irreversible dysfunction or death [4]. The clinical significance of hypertensive emergencies extends beyond the absolute blood pressure value. Acute organ injury is influenced by the rapidity and magnitude of blood pressure elevation, the patient's baseline blood pressure, underlying vascular disease, comorbid illnesses, and the capacity of individual organs to autoregulate blood flow [5]. A

sudden increase in systemic vascular resistance may trigger endothelial injury, increased vascular permeability, activation of inflammatory and coagulation pathways, and further vasoconstriction. This self-perpetuating process can impair tissue perfusion and produce ischemic or hemorrhagic damage [6].

The brain, heart, kidneys, and vascular system are particularly vulnerable, resulting in clinical manifestations such as hypertensive encephalopathy, ischemic or hemorrhagic stroke, acute coronary syndrome, acute left ventricular failure with pulmonary edema, acute kidney injury, and other forms of multisystem involvement [7].

Patients with hypertensive emergencies may present to the emergency department with a wide range of symptoms. Headache, giddiness, altered sensorium, focal neurological deficits, seizures, chest pain, dyspnoea, visual symptoms, and reduced urine output may occur either alone or in combination [8]. Because some of these manifestations are non-specific, a systematic emergency assessment is essential. Accurate blood pressure measurement, rapid evaluation of airway, breathing and circulation, focused neurological and cardiovascular examination, electrocardiography, laboratory evaluation of renal function and electrolytes, and appropriate imaging are required to identify the type and extent of target-organ damage [9].

Management must then be individualized according to the affected organ system, as both delayed treatment and excessively rapid reduction of blood pressure may worsen tissue perfusion and clinical outcomes [10]. Hypertensive emergencies also represent an important public health challenge because they frequently reflect inadequate long-term detection and control of chronic hypertension. Their management often requires emergency department resources, advanced diagnostic investigations, intravenous antihypertensive therapy, intensive monitoring, and, in severe cases, critical care support.

Survivors may experience persistent neurological disability, chronic kidney disease, or cardiac dysfunction, creating additional long-term health and socioeconomic burdens [11]. Therefore, understanding the demographic characteristics, patterns of presentation, and spectrum of organ involvement in these patients is important for improving triage, diagnostic pathways, treatment protocols, and preventive strategies [11]. Although hypertensive emergencies have been described in several international and Indian studies, region-specific data from emergency departments in central India remain limited. Variations in population characteristics, healthcare access, treatment adherence, referral patterns, and

availability of emergency services may influence the clinical profile and pattern of target-organ damage. L.N. Medical College and J.K. Hospital, Bhopal, serves a heterogeneous urban and rural population and provides an appropriate setting to characterize these patients prospectively. Accordingly, the present study was undertaken to evaluate the demographic and clinical profile of patients presenting with hypertensive emergencies, with specific emphasis on their mode of presentation and the spectrum of acute target-organ damage. The findings are expected to provide locally relevant evidence that may support earlier recognition, more structured emergency evaluation, and improved management of this potentially fatal condition. Such data may also help guide resource allocation, clinician training, patient education, and hypertension prevention programs [12].

Materials and Methods

This prospective observational study was conducted in the Department of Emergency Medicine, L. N. Medical College and J. K. Hospital, Bhopal, over 18 months. A total of 98 adult patients presenting with hypertensive emergency were included using consecutive sampling. Hypertensive emergency was defined as severe elevation of blood pressure associated with evidence of acute target-organ damage. Demographic details, presenting symptoms, vital parameters, blood pressure, clinical examination findings, laboratory investigations, and evidence of neurological, cardiovascular, renal, or multiple target-organ damage were recorded. Patients not fulfilling the study criteria, those refusing consent, pregnant women, patients below 18 years, and those with selected pre-existing conditions specified in the protocol were excluded.

Data were analysed using descriptive statistics. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Associations between variables were assessed using the Chi-square test, with $p < 0.05$ considered statistically significant. Ethical approval was obtained from the Institutional Ethics Committee, and informed consent was taken from all participants.

Results

A total of 98 patients presenting with hypertensive emergencies were included in the final analysis. Complete demographic, clinical, laboratory, and target-organ damage data were available for all participants.

Demographic Characteristics: The mean age of the study population was 53.78 ± 15.81 years, with a median age of 56.5 years and an age range of 18–83 years. The largest proportion of patients

belonged to the 41–60-year age group (46.9%), followed by those aged 61–80 years (29.6%). Overall, 76.5% of patients were older than 40

years. Male patients predominated, accounting for 62.2% (61/98) of the study population, with a male-to-female ratio of approximately 1.65:1 (Fig 1).

Table 1: Demographic characteristics of study participants (n = 98)

Characteristic	Frequency (n)	Percentage (%)
Age group (years)		
≤20	1	1.0
21–40	18	18.4
41–60	46	46.9
61–80	29	29.6
≥81	4	4.1
Gender		
Male	61	62.2
Female	37	37.8

Mean age: 53.78 ± 15.81 years; median: 56.5 years; range: 18–83 years.

Clinical presentation: Patients presented with a wide spectrum of symptoms. Headache was the most common presenting symptom, reported by 64 patients (65.3%). Giddiness and chest pain were each present in 49 patients (50.0%). Nausea and/or vomiting occurred in 35 patients (35.7%), while

neurological deficit was documented in 24 patients (24.5%).

Dyspnoea occurred in 20 patients (20.4%), and visual disturbance was the least frequent symptom, reported in 9 patients (9.2%) (Fig. 2).

Table 2: Presenting symptoms among patients with hypertensive emergencies (n = 98)

Presenting symptom	Present, n (%)	Absent, n (%)
Headache	64 (65.3)	34 (34.7)
Giddiness	49 (50.0)	49 (50.0)
Chest pain	49 (50.0)	49 (50.0)
Nausea/Vomiting	35 (35.7)	63 (64.3)
Neurological deficit	24 (24.5)	74 (75.5)
Dyspnoea	20 (20.4)	78 (79.6)
Visual disturbance	9 (9.2)	89 (90.8)

Mode of presentation: Based on the predominant organ systems involved at admission, mixed presentation was the most frequent mode, occurring in 48 patients (49.0%). Neurological presentation

was observed in 37 patients (37.8%), whereas cardiovascular and respiratory presentations were documented in 8.2% and 5.1% of patients, respectively (fig. 3).

Table 3: Mode of presentation among study participants (n = 98)

Mode of presentation	Frequency (n)	Percentage (%)
Mixed	48	49.0
Neurological	37	37.8
Cardiovascular	8	8.2
Respiratory	5	5.1
Total	98	100.0

Blood pressure at presentation: Marked elevation of both systolic and diastolic blood pressure was observed at admission. The mean systolic blood pressure (SBP) was 203.99 ± 19.43 mmHg, with values ranging from 180 to 260 mmHg. The mean diastolic blood pressure (DBP) was 128.86 ± 13.81 mmHg, ranging from 110 to 160 mmHg. Overall, 56.1% of patients had an SBP ≥200 mmHg, while 48.0% had a DBP ≥130 mmHg.

Table 4: Blood pressure profile at presentation (n = 98)

Blood pressure parameter	Mean ± SD (mmHg)	Median (mmHg)	Minimum	Maximum
Systolic blood pressure	203.99 ± 19.43	203.0	180	260
Diastolic blood pressure	128.86 ± 13.81	127.5	110	160

The distribution of SBP was 180–199 mmHg in 43 patients (43.9%), 200–219 mmHg in 35 (35.7%), and ≥ 220 mmHg in 20 (20.4%). For DBP, 29 patients (29.6%) had values of 110–119 mmHg, 22 (22.4%) had values of 120–129 mmHg, and 47 (48.0%) had DBP ≥ 130 mmHg.

Target-organ damage: Target-organ damage was frequently observed among patients presenting with

hypertensive emergencies. Neurological and renal target-organ damage were the most frequently documented categories, each occurring in 29 patients (29.6%).

Cardiovascular target-organ damage was present in 27 patients (27.6%). Importantly, 21 patients (21.4%) had simultaneous involvement of more than one target organ system (fig. 4).

Table 5: Distribution of target-organ damage among study participants (n = 98)

Type of target-organ damage	Frequency (n)	Percentage (%)
Neurological TOD	29	29.6
Renal TOD	29	29.6
Cardiovascular TOD	27	27.6
Multiple TOD	21	21.4

TOD: Target-organ damage.

Association with Target-organ Damage:

Although higher systolic and diastolic blood-pressure categories showed a greater absolute frequency of neurological, cardiovascular, renal, and multiple target-organ damage, no statistically significant association was observed between categorized SBP or DBP and any category of target-organ damage ($p > 0.05$ for all comparisons). Similarly, the thesis reports no statistically significant association between age or gender and the individual categories of target-organ damage.

Among the 98 patients with hypertensive emergencies, the mean age was 53.78 ± 15.81 years, with 46.9% belonging to the 41–60-year age group and 62.2% being male. Headache was the most frequent presenting symptom (65.3%), followed by giddiness and chest pain (50.0% each). Mixed clinical presentation was most common (49.0%), followed by neurological presentation (37.8%). Mean SBP and DBP at admission were 203.99 ± 19.43 mmHg and 128.86 ± 13.81 mmHg, respectively. Neurological and renal target-organ damage were each present in 29.6% of patients, cardiovascular involvement in 27.6%, and multiple target-organ damage in 21.4%. No significant association was identified between categorized blood pressure values and the pattern of target-organ damage.

Discussion

In the present study, 98 patients with hypertensive emergencies were evaluated. The mean age was 53.78 ± 15.81 years, and most patients belonged to the 41–60-year age group. Males constituted 62.2% of the study population, showing a clear male predominance. Headache was the most common presenting symptom (65.3%), followed by giddiness and chest pain (50.0% each). Mixed clinical presentation was the most frequent mode of presentation (49.0%), followed by neurological presentation (37.8%). These findings highlight the

varied and often multisystem presentation of hypertensive emergencies. The mean systolic and diastolic blood pressures at admission were 203.99 ± 19.43 mmHg and 128.86 ± 13.81 mmHg, respectively, indicating marked blood pressure elevation at presentation.

Regarding target-organ involvement, neurological and renal damage were each present in 29.6% of patients, while cardiovascular damage occurred in 27.6%. Multiple target-organ involvement was observed in 21.4% of cases, demonstrating the severity and multisystem nature of hypertensive emergencies. No statistically significant association was observed between blood pressure category, age, or gender and the pattern of target-organ damage. This suggests that organ injury may depend not only on the absolute blood pressure level but also on other clinical factors.

Overall, early recognition and rapid assessment of neurological, cardiovascular, and renal involvement are important for effective management of hypertensive emergencies.

Conclusion

Hypertensive emergencies are serious, multisystem conditions associated with significant acute target-organ involvement. In the present study of 98 patients, most were middle-aged, with a predominance of males. Headache was the most common presenting symptom, while mixed and neurological presentations were frequently observed.

Neurological and renal target-organ damage were each present in 29.6% of patients, cardiovascular involvement in 27.6%, and multiple organ involvement in 21.4%. No significant association was found between age, gender, or blood pressure category and the pattern of target-organ damage. These findings emphasize the need for early recognition, rapid assessment of target-organ

damage, and timely management of patients presenting with hypertensive emergencies to reduce complications and improve outcomes.

References

1. Yizengaw, M.A., et al., In-hospital outcomes of patients with a hypertensive emergency at a medical center, Ethiopia: a prospective observational study. *Health Science Reports*, 2022. 5(5): p. e845.
2. Israr, M., et al., Clinical Profile and Outcome of Hypertensive Emergencies: A Prospective Observational Study. *Current Hypertension Reviews*, 2026.
3. Miller, J.B., et al., Evaluation and management of hypertensive emergency. *Bmj*, 2024. 386.
4. Fragoulis, C., et al., One-year outcomes following a hypertensive urgency or emergency. *European Journal of Internal Medicine*, 2024. 120: p. 107-113.
5. Maloberti, A., et al., Therapeutic approach to hypertension urgencies and emergencies in the emergency room. *High Blood Pressure & Cardiovascular Prevention*, 2018. 25(2): p. 177-189.
6. Shao, P.J., et al., Profile of patients with hypertensive urgency and emergency presenting to an urban emergency department of a tertiary referral hospital in Tanzania. *BMC cardiovascular disorders*, 2018. 18(1): p. 158.
7. Theofilis, P., et al., Hypertensive urgencies and emergencies in the cardiology emergency department: epidemiology, patient profile, and management. *Journal of Human Hypertension*, 2025. 39(7): p. 509-514.
8. Adebayo, O. and R.L. Rogers, Hypertensive emergencies in the emergency department. *Emergency Medicine Clinics*, 2015. 33(3): p. 539-551.
9. Shin, J.-H., et al., Clinical characteristics and predictors of all-cause mortality in patients with hypertensive urgency at an emergency department. *Journal of Clinical Medicine*, 2021. 10(19): p. 4314.
10. Balahura, A.-M., et al., The management of hypertensive emergencies—is there a “magical” prescription for all? *Journal of Clinical Medicine*, 2022. 11(11): p. 3138.
11. Chan, S.S.-W., C.A. Graham, and T.H. Rainer, Hypertension in the emergency department. *Current hypertension reports*, 2016. 18(5): p. 37.
12. Suneja, M. and M.L. Sanders, Hypertensive emergency. *Medical Clinics*, 2017. 101(3): p. 465-478.