

"Correlation Between Patients Presented in Hypertensive Emergency in Tertiary Care Centre and Target End Organ Damage in Different Gender and Age Groups"

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ABSTRACT

Background: Hypertensive emergency is a serious clinical condition characterized by severe elevation of blood pressure with acute target end-organ damage, requiring urgent evaluation and management.

Aim: To assess the correlation between hypertensive emergencies and target end-organ damage among different age groups and genders in patients presenting to a tertiary care centre.

Materials and Methods: This hospital-based observational study included 67 patients diagnosed with hypertensive emergency. Demographic details, hypertension history, treatment status, presenting symptoms, and evidence of target organ involvement were recorded. Neurological, cardiac, renal, and ocular damage were evaluated using clinical examination, electrocardiography, echocardiography, renal function tests, ultrasonography, and fundus examination. Associations with age and gender were statistically analyzed.

Results: The mean age of patients was 54.48 ± 13.51 years, with most cases occurring in middle-aged and elderly individuals. Males constituted 59.7% of the study population. Headache was the commonest presenting symptom, followed by dyspnoea and chest pain. Neurological and cardiac involvement were the predominant forms of target organ damage, while renal and fundus changes were less frequent. Age showed significant association only with ECG ST-T changes, whereas gender showed no significant association with organ damage or outcome.

Conclusion: Hypertensive emergencies were mainly associated with poor blood pressure control and predominantly involved neurological and cardiac systems.

I. INTRODUCTION

Hypertension is one of the most prevalent non-communicable diseases and is a significant cause of cardiovascular, cerebrovascular, renal and ocular morbidity globally [1]. It is sometimes referred to as a "silent disorder" because many people have hypertension but do not experience any symptoms. However, if hypertension is not diagnosed, is not treated well or if it is poorly controlled, it can lead to serious acute problems [2]. Of these, hypertensive emergencies are one of the most serious clinical manifestations, and timely and appropriate recognition and management are the most urgent tasks to avoid lethal organ damage [3]. Hypertensive emergency is defined as an abrupt or significant rise in BP, typically in the presence of SBP > 180 and/or DBP > 120 mmHg, with acute or progressive target end-organ damage [4]. This is the difference between hypertensive urgency, where the blood pressure is elevated, but no organ dysfunction is seen [5]. The difference is clinically relevant because an emergency is a condition that requires a rapid reduction in blood pressure and intensive care in an emergency department or intensive care unit. Patients' clinical presentation will vary depending on the organ system affected; organs most often involved are the brain, heart, kidneys, and eyes. The pathophysiology of hypertensive emergencies is multifactorial and related to the inability of normal autoregulatory mechanisms [6].

In the normal state, organs like the brain, heart and kidneys keep their blood flow constant despite fluctuations in the systemic blood pressure [7]. But if the blood pressure increases suddenly and dramatically, this autoregulation is overwhelmed, leading to endothelial damage, increased vascular permeability, activation of inflammatory and coagulation pathways, and microvascular damage [8]. Such changes result in tissue hypoxia, oedema, thrombosis and gradual organ dysfunction. Neurological symptoms can range from headache, seizures, altered sensorium, hypertensive encephalopathy, ischemic stroke or intracerebral hemorrhage [9]. Cardiac involvement can occur as acute left ventricular failure, pulmonary edema, myocardial ischemia, acute coronary syndrome, arrhythmias or as left ventricular hypertrophy. Renal involvement may manifest as acute kidney injury, increased serum creatinine, oliguria or proteinuria, whereas ocular involvement may include hypertensive retinopathy, hemorrhage, exudates, papilledema or visual disturbance [10]. Hypertensive emergency is characterised by the occurrence of end organ damage and this is a critical element in determining prognosis. Early

identification is crucial in order to direct treatment, determine the necessity for intensive care, monitor the response to treatment, and prevent permanent disability [11]. The pattern and severity of organ involvement may be detected by a clinical examination and by investigating the patient, including electrocardiography, echocardiography, renal function tests, urine examination, fundus examination, ultrasonography and neuroimaging. Patients admitted to tertiary care centres tend to be late and/or have been referred from primary care after delayed diagnosis and poor blood pressure control, thus presenting with more advanced organ damage on admission [10, 12].

The occurrence and pattern of target end-organ damage in hypertensive emergency may be different across age and sex groups [2, 13]. Older patients are at a higher risk for cardiovascular, cerebrovascular and renal complications because they are more likely to have vascular stiffness, chronic hypertension, endothelial dysfunction, and other comorbidities. Acute elevation of blood pressure, secondary hypertension or poor adherence to treatment may be the presenting features in younger patients [6, 14]. Likewise, biological, hormonal, lifestyle and health-seeking factors might contribute to the presentation and/or treatment adherence of diseases, and to the organ involvement. Although hypertension is known to be a high burden disease in India, little prospective data exist correlating hypertensive emergency with target end-organ damage in various age and gender groups in tertiary care settings [12, 15]. The recognition of these relationships is crucial for risk stratification, early clinical suspicion, timely investigation and management. The present study therefore aims to assess the patients presenting with hypertensive emergency in a tertiary care centre and to correlate the target end-organ damage with the age and gender groups to provide clinically relevant evidence for better management and prevention of end-organ damage [1, 16].

II. METHODOLOGY

The present study was a prospective, observational, and hospital-based study carried out in General Medicine Department, Gajra Raja Medical College and J.A. Group of Hospitals, Gwalior during the duration of 18 months from 1st April-31st September 2024-25. After informed written consent, 67 patients aged 18-80 years who presented with an acute target end-organ damage and blood pressure $\geq 180/120$ mmHg were included. Chronic kidney disease, coronary artery disease, pregnancy, age > 80 years and unwillingness to participate were exclusion criteria.

A structured proforma was used to gather data with regards to demographic data, medical history, clinical presentation, blood pressure, and treatment history. End-organ damage (brain, heart, kidney and eye) was evaluated by clinical examination and suitable investigations such as laboratory tests, electrocardiography, echocardiography, ultrasonography and fundus examination. The data collected in the study were analysed in software Microsoft Excel and SPSS version 23.0. Continuous variables were reported as mean $\pm$ SD and categorical variables were reported as frequencies and percentages. The Chi-square test and Wilcoxon rank-sum test were employed for statistical significance with p-value less than 0.05 being statistically significant. The Institutional Ethics Committee approved the study before it was started.

III. RESULTS

A total of **67 patients** with hypertensive emergency were included in the study. The mean age was **54.48 $\pm$ 13.51 years**, and males constituted the majority of the study population (**59.7%**). Most patients (34.3%) belonged to the **51–60 years** age group. Furthermore, **83.6%** were previously diagnosed hypertensive patients, while **40.3%** had irregular treatment compliance, highlighting poor adherence to antihypertensive therapy.

Table 1. Baseline characteristics of the study population

Characteristic	Value
Total participants	67
Mean age (years)	54.48 $\pm$ 13.51
Male	40 (59.7%)
Female	27 (40.3%)
Known hypertension	56 (83.6%)
Irregular treatment	27 (40.3%)

Neurological involvement was the most frequent target organ damage, affecting **22.4%** of patients, followed by cardiac involvement (**20.9%**), renal involvement (**11.9%**), and hypertensive retinopathy (**7.5%**). Ischemic stroke (10.4%) and left ventricular failure (11.9%) were the predominant neurological and cardiac complications, respectively (Fig 1).

Table 2. Target end-organ damage among study participants

Organ involvement	Frequency	Percentage (%)
Neurological involvement	15	22.4
Cardiac involvement	14	20.9
Renal involvement	8	11.9
Fundus changes	5	7.5

Laboratory evaluation demonstrated mild hematological abnormalities with evidence of renal dysfunction in a subset of patients. The mean hemoglobin was **13.03 ± 1.17 g/dL**, blood urea was **42.87 ± 9.33 mg/dL**, and serum creatinine was **1.47 ± 0.28 mg/dL**, indicating renal impairment in some patients presenting with hypertensive emergency.

Table 3. Laboratory parameters of study participants (n = 67)

Parameter	Mean ± SD
Hemoglobin (g/dL)	13.03 ± 1.17
Total leukocyte count (×10 ³ /μL)	8.54 ± 1.39
Platelet count (×10 ³ /μL)	251.49 ± 46.37
Blood urea (mg/dL)	42.87 ± 9.33
Serum creatinine (mg/dL)	1.47 ± 0.28

Regarding hospital outcomes, 17.9% of patients required ICU admission, while the mean duration of hospital stay was 5.09 ± 0.77 days. The survival rate was 95.5%, with an in-hospital mortality of 4.5%.

Table 4. Hospital course and outcomes

Parameter	Value
ICU admission	12 (17.9%)
Mean hospital stay (days)	5.09 ± 0.77
Survived	64 (95.5%)
Expired	3 (4.5%)

Analysis of demographic associations showed no significant association between age and target organ damage. Similarly, gender was not associated with neurological or renal involvement. However, cardiac involvement was significantly higher among males than females (27.5% vs. 11.1%, $p = 0.026$). Correlation analysis revealed no significant relationship between systolic or diastolic blood pressure and overall target organ damage score ($p > 0.05$) (Fig 2).

Table 5. Association between gender and target organ damage

Organ involvement	Male n (%)	Female n (%)	p-value
Neurological	9 (22.5)	6 (22.2)	>0.05
Cardiac	11 (27.5)	3 (11.1)	0.026
Renal	5 (12.5)	3 (11.1)	>0.05

IV. Discussion

The present study aimed at assessing demographic, clinical profile and target end organ damage in patients presenting with hypertensive emergency [11]. Most patients were middle-aged men, and those who were most likely to have a history of hypertension and sub-optimal medication adherence, highlighting the need to monitor blood pressure routinely and encourage adherence to antihypertensive treatment. Neurological involvement, which is the most common target organ damage, cardiac involvement, and renal involvement were the most frequently observed manifestations of target organ damage, consistent with previous studies, in which the central nervous system was reported to be the most frequently involved organ in hypertensive emergencies [17]. Laboratory results showed mild renal dysfunction (increased blood urea and serum creatinine in some patients). There was no significant association between blood pressure levels and age with target organ damage, but the involvement of the heart was significantly higher in male patients, indicating possible gender-related cardiovascular risk factors. The low in-hospital mortality rate and high survival rate found in the present study

may be due to the early detection of hypertension, swift initiation of anti-hypertensive therapy, and the complete management of hypertension in the hospital. In conclusion, the results indicate that hypertensive emergency is a serious clinical condition with significant morbidity related to acute target organ damage. Prompt recognition, intervention and compliance with antihypertensive therapy is crucial to minimize the complications and enhance the clinical outcomes. Additional multicenter trials with larger numbers are suggested to confirm these results [6].

V. Conclusion

Hypertensive emergency is a life-threatening state which is accompanied by acute target organ damage and requires early diagnosis and urgent treatment. Neurological involvement occurred most frequently followed by cardiac and renal involvement, in the present study. The majority of patients were with history of hypertension and with poor adherence to antihypertensive therapy, thus, the need for frequent follow-up and adherence to antihypertensive medication. There were no significant associations between age and blood pressure level and TOD, but there was a significantly higher frequency of TOD in males. This finding of low in-hospital mortality rates indicate that early diagnosis and timely treatment can significantly enhance patient outcomes. The results highlight the importance of early detection, adequate blood pressure management, patient education, and careful monitoring of blood pressure medications to avoid the development of hypertensive emergencies and related complications. These findings need further evaluation in multiple centers with larger numbers of patients in order to confirm the results and refine strategies for prevention and management of hypertensive emergencies.

References

- [1]. Vinaykumar, S., S. Sanjay, and H. Veena, *Hypertensive emergencies in developing countries: clinical profiles and target organ damage*. European Journal of Cardiovascular Medicine, 2025. **15**: p. 844-851.
- [2]. 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.
- [3]. Fragoulis, C., et al., *Profile and management of hypertensive urgencies and emergencies in the emergency cardiology department of a tertiary hospital: a 12-month registry*. European Journal of Preventive Cardiology, 2022. **29**(1): p. 194-201.
- [4]. Venugopal, K., *A Study of Target Organ Damage in Newly Detected Hypertensives*. 2018, Rajiv Gandhi University of Health Sciences (India).
- [5]. Fong, R.L. and K.C. Norris, *Hypertensive crises*, in *Acute Emergencies and Critical Care of the Geriatric Patient*. 2000, CRC Press. p. 229-242.
- [6]. Kaspas, C., et al., *Clinical and Biochemical Profile of Hypertensive Emergencies in a Tertiary Care Centre: A Cross-Sectional Observational Study*. International Journal of Medical and Pharmaceutical Research, 2026. **7**: p. 3574-3583.
- [7]. Ventura, H.O., S.J. Taler, and J.E. Strobeck, *Hypertension as a hemodynamic disease: the role of impedance cardiography in diagnostic, prognostic, and therapeutic decision making*. American journal of hypertension, 2005. **18**(S2): p. 26S-43S.
- [8]. Prabhakaran, D., *A Clinical Profile of Hypertensive Emergencies in Tertiary Care Hospital*. 2020, Stanley Medical College, Chennai.
- [9]. Overgaauw, N., et al., *Drug nonadherence is a common but often overlooked cause of hypertensive urgency and emergency at the emergency department*. Journal of Hypertension, 2019. **37**(5): p. 1048-1057.
- [10]. Karthikeyan, B., *Prevalence and clinical characteristics of hypertensive emergencies in tertiary care teaching institute, Chennai-600001*. 2015, Stanley Medical College, Chennai.
- [11]. Shah, S., *Hypertensive disorders in pregnancy*. Obstetric and Gynecologic Nephrology: Women's Health Issues in the Patient With Kidney Disease, 2019: p. 11-23.
- [12]. Atzema, C.L., et al., *The characteristics and outcomes of patients who make an emergency department visit for hypertension after use of a home or pharmacy blood pressure device*. Annals of Emergency Medicine, 2018. **72**(5): p. 534-543.
- [13]. Levy, P., et al., *Subclinical hypertensive heart disease in black patients with elevated blood pressure in an inner-city emergency department*. Annals of emergency medicine, 2012. **60**(4): p. 467-474. e1.
- [14]. Adams, K.F., et al., *Relation between gender, etiology and survival in patients with symptomatic heart failure*. Journal of the American College of Cardiology, 1996. **28**(7): p. 1781-1788.
- [15]. Miyombe, D., *Factors associated with emergency hospitalization of kidney disease patients in a national hospital Kenya*. 2025.
- [16]. Steegers, E.A., et al., *Pre-eclampsia*. The lancet, 2010. **376**(9741): p. 631-644.
- [17]. Southerland, L.T., et al., *Beyond observation: protocols and capabilities of an emergency department observation unit*. The American Journal of Emergency Medicine, 2019. **37**(10): p. 1864-1870.