

Original Research Article

Clinical profile of patients with hypertensive emergencies in a tertiary care hospital

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ABSTRACT

Background: Hypertensive emergency is defined by systolic blood pressure (SBP) ≥ 180 mmHg and/or diastolic blood pressure (DBP) ≥ 120 mmHg with acute target organ damage. Hypertensive emergencies can be life threatening and fatal unless timely treated. In the present study we aim to study the clinical profile and outcome of patients admitted with hypertensive emergency in the medical intensive care unit in our hospital.

Methods: A cross-sectional observational study of all cases with hypertensive emergency admitted in Medical Intensive care unit (ICU) in Government General Hospital, Srikakulam during the study period was conducted. The clinical profile and outcome of the patients were assessed.

Results: Out of the fifty patients in the present study, about 36 (72%) were males and 14 were females (28%) and about one third of the patients (36%) belonged to the age group of 60-69 years. Diabetes mellitus (30%) and dyslipidemia (40%) were the commonly encountered comorbidities in the study population. Most frequent presenting symptoms were neurological deficits (50%) followed by dyspnoea (32%) and chest pain (24%). Intracerebral haemorrhage was the commonest target organ damage found in 30% of the patients. Patients presenting with hypertensive emergencies with neurological target organ damage had statistically significant increased chance of mortality ($p=0.007$).

Conclusions: As hypertension emergencies are consequence of uncontrolled hypertension, it is important to educate and bring awareness among public regarding the screening, early detection, and adherence to prescribed medication for hypertension to avoid adverse clinical outcomes.

Keywords: Hypertensive emergencies, Hypertension, Target organ damage

INTRODUCTION

A hypertensive emergency (HE) can be fatal, and it is one of the most challenging conditions to treat in the emergency department (ED). Patients with uncontrolled hypertension can develop a hypertensive crisis, generally classified as hypertensive emergency or hypertensive urgency. Hypertensive crisis is defined by systolic blood pressure (SBP) ≥ 180 mmHg and/or diastolic blood pressure (DBP) ≥ 120 mmHg. Hypertensive emergency is hypertensive crisis with acute target organ damage.¹ Hypertensive emergencies are more critical since the condition is associated with acute vital organ damage such

as stroke, hypertensive encephalopathy, acute heart failure, acute pulmonary edema, acute coronary syndromes (ACS), hypertensive retinopathy, acute renal insufficiency, and acute aortic dissection. Globally, it has been reported that around 1–3% of hypertensive patients experience hypertensive emergencies.² In a study done by Dhadke et al in India, the prevalence of hypertensive emergencies was 1.22% in their intensive care unit.³

The pathophysiology of hypertensive emergencies lies in the impaired autoregulation of blood pressure of the vital organs. Autoregulation is a phenomenon in which the blood flow and organ perfusion are maintained to the vital

organs despite considerable changes in the perfusion pressure. Loss of this phenomenon of autoregulation is the hallmark of hypertensive emergencies. Abrupt and severe elevation of blood pressure activates the renin-angiotensin-aldosterone system (RAAS), which increases the peripheral vascular resistances in the vital organs, thus causing alterations in the autoregulation process. In addition, the oxidation stress and reduced bioactivity of nitric oxide produces endothelial dysfunction. Consequent to the damage to the endothelium, the activation of platelet aggregation and the clotting cascade take place.⁴ Thus, a rapid and dangerous elevation of blood pressure can always be fatal.

Such patients with hypertensive emergencies have varied clinical presentations, viz. stroke, hypertensive encephalopathy, acute heart failure, acute pulmonary oedema, acute coronary syndromes (ACS), hypertensive retinopathy, acute renal insufficiency and acute aortic dissection based on the target organs involved. Such patients must be identified at the earliest in the emergency room and appropriate anti-hypertensive medication must be administered as guided by the clinical scenario.

On reviewing the literature, we find that there is paucity of data regarding the clinical presentation and outcome of patients with hypertensive emergencies in our region in Andhra Pradesh. In the present study we aim to study the clinical profile and outcome of patients admitted with hypertensive emergency in the medical intensive care unit in our hospital.

METHODS

A cross sectional observational study of all cases with hypertensive emergency admitted in medical intensive care unit (ICU) in Government General Hospital, Srikakulam was conducted. The study was approved by the institutional ethical committee. The study included patients admitted from 01 April 2023, to 30 June 2023 (3 months). Inclusion criteria included patients with age >18 years presenting with hypertensive emergency defined as elevated blood pressure ≥ 180 mm systolic blood pressure and ≥ 120 diastolic pressure at admission with evidence of end organ damage either clinically or biochemically (such as hypertensive encephalopathy; stroke (cerebral infarction or intracerebral or subarachnoid hemorrhage, transient ischemic attack); acute left ventricular failure; acute myocardial infarction or unstable angina, aortic dissection, progressive renal insufficiency and features suggestive of retinopathy). Pregnant women with pregnancy induced hypertension were excluded from the study. Also, patients who didn't consent for participation and who left the hospital against medical advice/absconded were excluded. A convenient sample was taken. Based on previous study by Kotruchin et al, the prevalence of hypertensive emergencies in Emergency department in Asia is 0.6-1.5%.¹ As per central limit theorem, the minimum sample size for the study was calculated as 24 using the following formula $4pq/l^2$, 'p',

the estimated proportion in the population depending on the previous studies is taken as 1.5% and 'l' is the allowable error, taken as 5%.

After informed consent, patients admitted in medical ICU with hypertensive emergencies fulfilling the inclusion criteria are interviewed personally by the principal investigators, with the case study proforma. If the patient was unable to give consent, the consent was obtained from the informant/attendant/guardian who was present with patient at admission. The historical details were also obtained from the informant/attendant/guardian. Clinical examination was carried out and recorded. Requisite data regarding diagnosis and laboratory investigations were entered in the proforma from the case sheet. The patients underwent treatment as per hospital protocol. Patient were followed up for the outcome in the form of discharge or death of the patient at the end of the hospital stay. The proforma consists of 7 sections with several questions appearing sequentially in order of: socio-demographic variables and, clinical history, clinical examination of the patient, investigations, final diagnosis of the patient, treatment given, and outcome: discharge/expired.

Data analysis

The collected data was organized into a Microsoft excel sheet and statistical package for social sciences (SPSS) v26 software version was utilized for statistical analyses. The descriptive data was expressed as mean, standard deviation (SD), frequency (n) and percentages (%). Demographic and clinical characteristics were compared among patients who expired and got discharged in the present study. The Chi square test was used to determine association between categorical variables. T test was done to compare the difference between means of various parameters of patient population with hypertensive emergencies those who survived and those who succumbed. Confidence intervals (CI) of 95% were calculated to quantify the association among different variables. P value <0.05 was considered as statistically significant.

RESULTS

Out of the fifty patients in the present study, about 36 (72%) were males and 14 (28%) were females (Figure 1). The mean age of the patients was 60.38 years. About one third of the patients (36%) belonged to the age group of 60-69 years. Diabetes mellitus and dyslipidemia were the commonly encountered comorbidities in the study population accounting for 30% and 40% respectively. In the present study, the presenting symptoms in these patients were neurological deficits including convulsions, visual deficits, cardiac symptoms like dyspnoea and chest pain. Neurological deficits were the most frequent clinical finding (50%) followed by dyspnoea (32%) and chest pain (24%) (Table 1). Among patients with neurological deficit, 20 patients (80%) had hemiparesis, 3 patients (12%) had convulsions and 2 patients (8%) had visual disturbance. A

total of 16 patients out of 25 patients who presented with neurological deficits were in altered sensorium.

Table 1: Demographic and clinical characteristics of the study population.

| Variable | Frequency (N=50) | Percentage |
|----------------------------|------------------|------------|
| Gender | | |
| Male | 36 | 72 |
| Female | 14 | 28 |
| Age (years) | | |
| 30-39 | 3 | 6 |
| 40-49 | 6 | 12 |
| 50-59 | 14 | 28 |
| 60-69 | 18 | 36 |
| ≥70 | 9 | 18 |
| Comorbidities | | |
| Diabetes mellitus | 15 | 30 |
| Dyslipidemia | 20 | 40 |
| Presenting symptoms | | |
| Neurological deficits | 15 | 50 |
| Dyspnea | 16 | 32 |
| Chest pain | 12 | 24 |
| Outcome | | |
| Discharged | 38 | 76 |
| Expired | 12 | 24 |

Neurological target organ damage (TOD) in the form of intracerebral haemorrhage was the commonest TOD found in 15 patients (30%) followed by acute ischemic stroke in 6 patients (12%), subarachnoid haemorrhage in 2 patients (4%), and hypertensive encephalopathy in 1 patient (2%). About 14 patients (28%) had acute left ventricular failure, 2 patients (6%) had acute myocardial infarction and about 7 patients (14%) suffered from unstable angina (14%) indicating cardiac TOD. Three among the fifty patients presented with malignant hypertension (Table 2 and Figure 2). Out of the 35 patients (70%) who were

previously hypertensives about 9 patients (26%) had discontinued medications. Out of 50 patients with hypertensive emergencies, 12 patients succumbed before discharge. The in-hospital mortality was 24%.

Table 2: Frequency of target organ damage in the present study.

| Target organ damage | Frequency (n=50) | Percentage |
|--------------------------------|------------------|------------|
| Acute intracerebral hemorrhage | 15 | 30 |
| Subarachnoid hemorrhage | 2 | 4 |
| Acute ischemic stroke | 6 | 12 |
| Hypertensive encephalopathy | 1 | 2 |
| Acute left ventricular failure | 14 | 28 |
| Acute myocardial infarction | 2 | 4 |
| Unstable angina | 7 | 14 |
| Malignant hypertension | 3 | 6 |

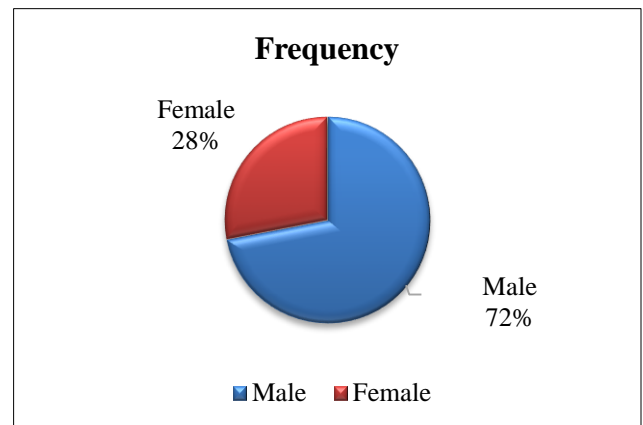


Figure 1: Distribution of gender in the present study.

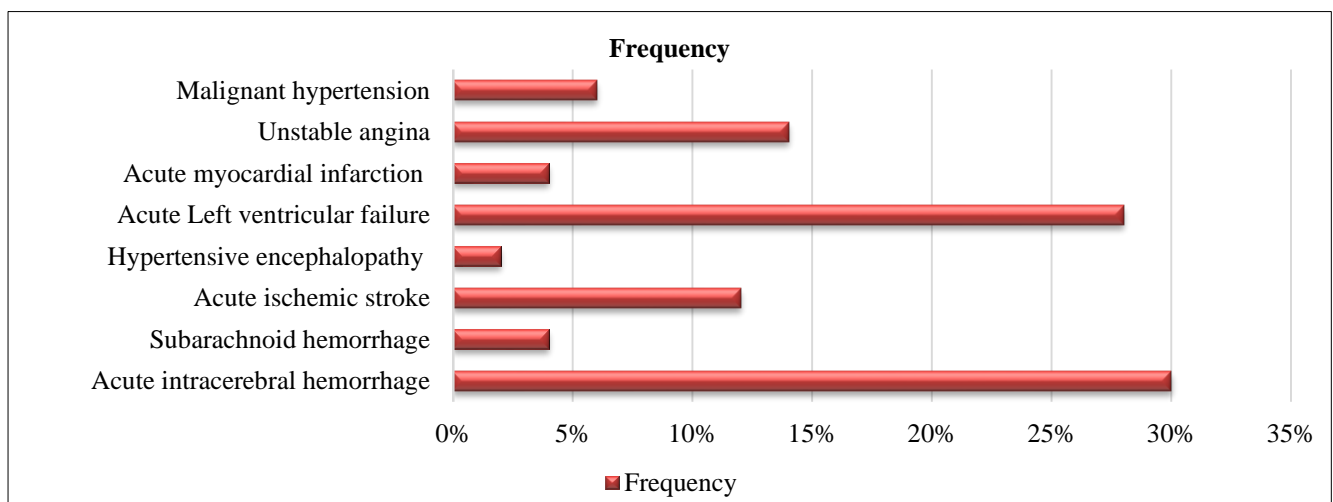


Figure 2: Frequency of target organ damage in the present study.

Table 3: Comparison of clinical characteristics based on outcome of the patients.

| Variable | Discharged (n=38) | Expired (n=12) | Chi sq. statistic | P |
|----------------------------|-------------------|----------------|-------------------|-----------|
| Gender | | | | |
| Male | 26 | 10 | 1.006 | 0.315866 |
| Female | 12 | 2 | | |
| Comorbidities | | | | |
| Diabetes mellitus | 7 | 8 | 2.9473 | 0.086023 |
| Dyslipidemia | 15 | 5 | | |
| Presenting symptoms | | | | |
| Neurological deficits | 14 | 11 | 9.7081 | 0.007604* |
| Chest pain | 11 | 1 | | |
| Dyspnea | 15 | 1 | | |

*P<0.05 is statistically significant

Table 4: Comparison of means of various variables based on outcome of the patients.

| Variable (mean values) | Discharged (n=38) | Expired (n=12) | t | P |
|-------------------------------------|-------------------|----------------|----------|----------|
| Age | 57.5 | 69.5 | -0.17464 | 0.863864 |
| Duration of hypertension (in years) | 6.259259259 | 10.5 | | |
| SBP at admission | 212.6315789 | 224.3333333 | | |
| DBP at admission | 121.5263158 | 138 | | |
| Blood urea (mg/dl) | 29.21052632 | 38.41666667 | | |
| Serum creatinine (mg/dl) | 1.236842105 | 0.958333333 | | |
| Serum sodium (meq/l) | 134.5405405 | 136.5833333 | | |
| Serum potassium (meq/l) | 4.218421053 | 4.25 | | |

SBP – Systolic blood pressure, DBP – diastolic blood pressure

Comparing the clinical characteristics of the patients who succumbed to those who survived and discharged, males were predominantly affected (10 out of 12 deaths). However, the difference was not statistically significant. Similarly, patients who could not survive the hypertensive emergency had a slightly higher prevalence of diabetes mellitus compared to those who survived. But this would have occurred by chance as the results were not statistically significant. In our present study, patients presenting with hypertensive emergencies with neurological target organ damage had statistically significant increased change of mortality compared to those who presented with chest pain or angina (Table 3). A longer duration of hypertension, probably uncontrolled and a higher blood pressure levels were associated with mortality in the present study. Among patients who were discharged, the mean systolic blood pressure (SBP) at the time of admission was 212 mm Hg as compared to 224 mm Hg in patients who could not survive. Similarly, the mean diastolic blood pressure (DBP) among patients who expired was higher (138 mm Hg) compared to those who survived (121 mm Hg). However, we found that these differences were not statistically significant (Table 4).

DISCUSSION

In the present clinical study on hypertensive emergencies done at Government General Hospital Srikakulam, about three fourths (72%) of the patients were males. In their study in hypertensive crises, Martin et al found that about half (55%) of patients presenting with hypertensive

emergencies were males.⁵ Male gender probably has an increased susceptibility to hypertension related target organ damage as compared to females. Majority of female patients belonged to the postmenopausal age group which shows susceptibility of postmenopausal age to end organ damage. This is also because postmenopausal female hemodynamic is not very much different from the male profile with regard to blood pressure.^{6,7} Two thirds of the patients in the present study were in their fifth (28%) and sixth decades (36%) at the time of presentation to the hospital.

Dyspnoea or shortness of breath was the common presenting symptom of hypertensive emergencies across many studies in Asia with a prevalence rate varying between 10-30%.⁸⁻¹¹ However, neurological impairment, in the form of hemiparesis was the most prevalent symptom (50%) in our study, followed by dyspnoea (30%) and chest pain (24%). This is similar to the studies done in Thai and Indonesian population.^{8,11} Headache and chest pain were the most prevalent symptoms of hypertensive emergency patients in studies done in Pakistan and Korea respectively.^{9,10} In the study conducted by Dhadke et al in Solapur, the most common presenting complaint was dyspnoea (34%) followed by neurological deficit (28%).³ In our present study, patients also had convulsions (12%) and visual deficits (8%). Therefore, it is essential to note that patients with severe hypertension with neurological deficit or dyspnoea should always be evaluated for any target organ damage as these are the most common form of presentations of hypertensive emergencies.

At the time of presentation, the mean (\pm SD) systolic blood pressure in the present study was 216 ± 25 mm Hg (maximum-280mm Hg) while the mean diastolic blood pressure recorded 126 ± 18 mm Hg (maximum-180 mg Hg). A mean systolic blood pressure (SBP)/ diastolic blood pressure (DBP) of 193 ± 26 mm Hg/ 129 ± 12 mm Hg was observed by Martin et al in their study.⁵ The mean SBP/DBP in our study is similar to study from Indonesia ($220\pm 21/119\pm 24$ mmHg).¹¹ However, studies by Almas et al from Pakistan and Kotruchin et al from Thailand showed a mean SBP/DBP of $202\pm 18/108\pm 17$ mmHg and $199\pm 20/105\pm 20$ mmHg, respectively.^{8,10} However, low initial SBP and DBP with a median of 188 (172–206) and 105 (99–115) mmHg were observed in a study in Korea.⁹ Blood pressure levels at presentation to the hospital were higher in the group of patients who expired compared to those who were discharged. The adverse outcome of these patients can be attributed to the greater target organ damage at higher levels of blood pressure.

Evaluation for target organ damage (TOD) in patients in the present study revealed that the most common TOD was intracerebral haemorrhage (30%) followed by acute left ventricular failure (28%) and unstable angina (14%). These results are similar to the previous studies in Asia where most hypertensive emergency patients admitted to the emergency suffered from stroke in Indonesians (57.6%) in Thais (49.8%) and in Koreans (43%).^{8,9,11} In the study conducted in Solapur by Dhadke et al, about 8% had grade IV hypertensive retinopathy and about 16% had acute left ventricular failure and one tenth of them had acute myocardial infarction.³ The most common manifestation of central nervous system was cerebral infarction (14%). Study by Martin et al showed Intracerebral haemorrhage (17%) left ventricular failure (25%), acute ischemic stroke (39%) and acute myocardial infarction in (8%) as TOD in their patients.⁵ Zampaglione et al in their study observed target organ damage in the form of left ventricular failure (23%), acute ischemic stroke (24%) and intracerebral haemorrhage (4.5%) in their patients.¹² However, in the study from Pakistan, the most common TOD was acute kidney injury (AKI) (41.3%), followed by acute coronary syndrome (28.8%), acute heart failure (18.3%), and stroke (6.5%).¹⁰ AKI was the second most common TOD in Indonesians (30.8%), while the second most common organ involvement in Thais and Koreans was heart disease.^{8,9,11} The variation in AKI prevalence between different populations could be due to differing diagnostic criteria utilized for diagnosing AKI in each study. Other confounding factors, such as concomitant disease, for example, drug abuse, diabetes mellitus, chronic kidney disease (CKD) need to be considered. The diagnostic criteria for each TOD should be standardized globally so that the confounding factors are eliminated.

Majority of patients in the present study were previously known hypertensives (70%) similar to the study done by Martin et al (83%).⁵ This evidence confirms that hypertensive emergencies were prevalent in patients with

previous history of hypertension. It also emphasizes the fact the patients with hypertension are at a higher risk of developing a hypertensive emergency, more so if they are non-adherent to the antihypertensive therapy. In the present study, 26% among the known hypertensives disregarded their hypertensive status and stopped antihypertensive medications which would have put them at a greater risk for acute target organ damage and hypertensive emergency.

Diabetes mellitus (30%) and dyslipidemia (40%) were the other risk factors present in our study population. The number of patients with diabetes mellitus were 26% in the study done by Martin et al.⁵ Diabetes and dyslipidemia would have added to premature atherosclerosis in these patients predisposing them to acute target organ damage. Prevalence of arterial hypertension in diabetic patients is greater when compared with that in non-diabetic patients (40-50% and 20%, respectively).¹³ Arterial hypertension can be complicated by metabolic abnormalities (hyperglycaemia, hyperinsulinemia, and dyslipidemia) which may play a pivotal role in the pathogenesis of complications.

The outcome of the study showed an in-hospital mortality of 24% of the patients presenting with hypertensive emergency, with predominant involvement of males and those with co morbidities of diabetes and dyslipidemia.

Limitations

The limitations of the present study are small sample size and sampling of cases from only one centre. Hence the results of the present study cannot be generalized to the Indian population. A larger sample size and recruitment of patients from multiple centres both urban and rural could identify the varied presentations of hypertensive emergencies and their outcome. There is a need to have a common protocol for management of hypertensive emergencies right from the first contact of the patient at the primary health centre to the tertiary care hospital. As hypertension emergencies are consequence of uncontrolled hypertension, it is important to educate and bring awareness among public regarding the screening, early detection, and adherence to prescribed medication for hypertension to avoid adverse clinical outcomes.

CONCLUSION

In conclusion, patients with hypertensive emergencies are regularly found in the emergency department. Identical to the various studies conducted across in Asia.² Stroke was the most common organ injury in our study presenting as a hypertensive emergency. Though previous studies recorded less mortality our study shows a mortality rate of about 24%.² Non-adherences to antihypertensive medication, delay in the referral from the primary health centre, late arrival to the tertiary care hospital, could have led to the higher mortality rate in our study population.

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