Association between Admission Blood Pressure, Stroke Severity and Early Outcome in Thrombolysed Ischemic Stroke Patients: A Single-Centre Experience from Northeast India

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ABSTRACT

BACKGROUND
Admission Blood Pressure (BP) is often elevated in acute ischemic stroke and may influence stroke severity and outcomes, especially in patients receiving thrombolysis. This relationship remains understudied in Northeast Indian populations.

OBJECTIVE
To assess the association between admission BP, stroke severity (NIHSS) and early outcome (modified Rankin Scale and in-hospital mortality) among thrombolysed ischemic stroke patients.

METHODS
This was a retrospective observational study conducted at a tertiary care centre in Northeast India. Data were collected from 29 ischemic stroke patients who underwent intravenous thrombolysis. Admission BP, NIHSS scores, mRS at discharge and in-hospital mortality were analyzed. Descriptive statistics and subgroup comparisons were used.

RESULTS
Higher admission BP values were associated with more severe strokes and poorer outcomes. Among the 8 patients who died, most had a systolic BP>160 mmHg and NIHSS>16. Lower BP and NIHSS were associated with favorable outcomes (mRS ≤ 2).

CONCLUSION
Admission BP serves as a potential early predictor of stroke severity and outcome. This real-world data from Northeast India reinforces the need for precise hemodynamic management in acute stroke.

KEYWORDS
Thrombolysis, Ischemic stroke patients, Stroke severity, Acute stroke, Precise hemodynamic management

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INTRODUCTION

Stroke is one of the leading causes of death and disability worldwide, with ischemic stroke accounting for approximately 85% of all cases. Among various modifiable risk factors, elevated blood pressure (BP) is the most prevalent and strongly associated with both stroke occurrence and post-stroke outcomes. In the acute phase of ischemic stroke, BP is often elevated due to stress, sympathetic overactivity or pre-existing hypertension.[1]

A U-shaped relationship between BP at admission and stroke outcomes has been established, suggesting that both hypotension and hypertension can negatively affect recovery. In thrombolysis-eligible patients, this relationship is crucial, as high BP increases the risk of Symptomatic Intracerebral Hemorrhage (SICH), whereas low BP may compromise perfusion to the ischemic penumbra. Clinical trials such as SITS-ISTR and ENCHANTED have evaluated BP thresholds in this population, but regional data, especially from Northeast India, remains sparse.[2]

This study aims to evaluate the association between admission BP, stroke severity and in-hospital outcomes among thrombolysed ischemic stroke patients in a tertiary care centre in Northeast India.[3]

MATERIALS AND METHODS

This retrospective observational study was conducted at the Department of Neurology, Gauhati Medical College and Hospital (GMCH), Assam. Patient data were extracted from the institutional stroke master chart between January 2022 and March 2025.

Inclusion criteria were adults aged ≥ 18 years with confirmed acute ischemic stroke who received intravenous thrombolysis and had recorded admission BP, NIHSS score and mRS at discharge. Patients with hemorrhagic stroke or incomplete data were excluded.[4]

Key variables collected included systolic and diastolic BP at admission, NIHSS (pre-thrombolysis), modified Rankin Scale (mRS) at discharge and in-hospital mortality. Patients were categorized based on admission systolic BP: <140 mmHg, 140-160 mmHg and >160 mmHg. Descriptive statistics were used to summarize data.

RESULTS

Among 29 thrombolysed ischemic stroke patients, the mean age was 61.4 ± 12.3 years, with 62% being male. Admission systolic BP ranged from 110 to 180 mmHg. Eleven patients had systolic BP>160 mmHg. These patients had a higher mean NIHSS (19.2) and worse outcomes compared to those with lower BP.[5]

Out of 29 patients, 8 died during hospitalization. All these patients had admission BP>160 mmHg and NIHSS>16. Patients with systolic BP between 130-150 mmHg and NIHSS<12 had favorable outcomes (mRS ≤ 2).

BP category (mmHg)	No. of patients	Mean NIHSS	favorable outcome (mRS ≤ 2)	Deaths
<140	10	11.6	8	0
140-160	8	13.4	5	1
>160	11	19.2	2	7

DISCUSSION

This study demonstrates a strong association between elevated admission blood pressure and both stroke severity and mortality in thrombolysed ischemic stroke patients. All patients who died had systolic BP>160 mmHg and NIHSS>16, indicating that high BP is not only a risk factor but also a marker of poor prognosis in acute stroke (Table 1).[6]

BP category (mmHg)	No. of patients	Mean NIHSS	Favorable outcome (mRS ≤ 2)	Deaths
<140	10	11.6	8	0
140-160	8	13.4	5	1
>160	11	19.2	2	7

Table 1. Blood Pressure, NIHSS and Outcomes.

Our findings align with previous research. The SITS-ISTR and VISTA registries have shown that both very high and very low BP at admission can adversely affect outcomes in patients undergoing thrombolysis. A meta-analysis by Tsivgoulis et al. concluded that patients with systolic BP in the range of 140-160 mmHg had the most favorable outcomes after thrombolysis. Our study supports this, with the best survival observed in patients with systolic BP in this range.[7]

The ENCHANTED trial evaluated intensive BP lowering in thrombolysed patients and found no significant difference in functional outcomes, although it did reduce the risk of symptomatic intracerebral hemorrhage. This suggests that overly aggressive BP lowering may not improve functional recovery but could reduce bleeding risks.

Mechanistically, elevated BP may exacerbate blood-brain barrier disruption, increase the risk of hemorrhagic transformation and worsen cerebral edema. Conversely, excessively low BP may impair collateral perfusion of the ischemic penumbra. Therefore, maintaining BP within an optimal range is crucial (Figure 1).[8]

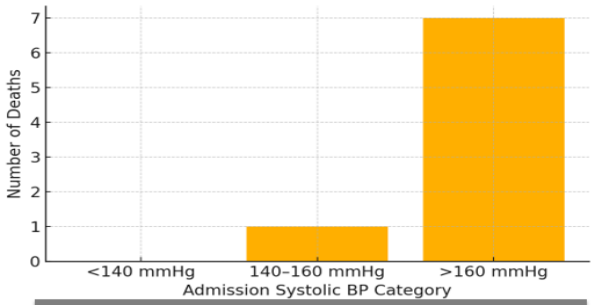

Figure 1. Mortality Distribution by Admission BP Category.

From a regional perspective, this study adds to the limited data available from Northeast India. Given the region's unique demographic and healthcare challenges, these findings highlight the need for context-specific stroke management protocols.

CONCLUSION

Admission blood pressure is significantly associated with stroke severity and early outcomes in thrombolysed ischemic stroke patients. BP levels above 160 mmHg are linked to higher NIHSS scores and mortality, while those between 130-150 mmHg are associated with better functional recovery. These findings underscore the importance of early BP monitoring and individualized BP management strategies in acute stroke care.

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ETHICAL APPROVAL

Ethics approval and consent to participate: Ethical clearance was waived due to retrospective design.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTEREST

The authors declare no competing interests.

DATA AVALABILITY

Data available upon reasonable request.

AUTHOR'S CONTRIBUTION

Dr. Akshay Bhutada-Concept, data analysis, manuscript drafting. Dr. Marami Das-Review and supervision.

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