

# Intravenous Thrombolysis in Acute Ischemic Stroke: A Combined Audit and Young Stroke Subgroup Analysis from a Tertiary Centre in Northeast India

## Research Article

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### Abstract

**Background:** Intravenous thrombolysis (IVT) is a well-established treatment modality in acute ischemic stroke (AIS), yet its real-world implementation varies regionally, especially in resource-limited settings like Northeast India. Furthermore, stroke in young adults (<50 years) represents a distinct subgroup with different etiological and outcome profiles. Intravenous Alteplase 0.9mg/kg was given in eligible patients.

**Objective:** To conduct a comprehensive audit of thrombolysis practices at a tertiary care center and to analyze clinical outcomes among young stroke patients undergoing IVT.

**Methods:** This retrospective observational study was conducted at the Department of Neurology, GMCH Guwahati. Among 444 ischemic stroke admissions, 29 patients received IVT between 2023 and 2024. Of these, 7 patients were under 50 years. Demographic, clinical, radiological, and outcome parameters were analyzed.

**Results:** The median NIHSS score before thrombolysis was 15. MCA territory involvement was universal. Post-thrombolysis NIHSS improved in 82.7% of cases. Overall mortality was 17.2%. Among young patients, the most common etiology was small vessel disease (TOAST Class 3), with favorable outcomes (mRS  $\leq 2$ ) in 57.1% and mortality in 28.6%.

**Conclusion:** IVT in AIS offers tangible functional benefits, including in younger adults. High mortality among young stroke despite early treatment emphasizes the need for early diagnosis and comprehensive care pathways..

**Keywords:** Ischemic Stroke; Thrombolysis; Young Stroke; TOAST; NIHSS; mRS; MCA Infarct

**Introduction**

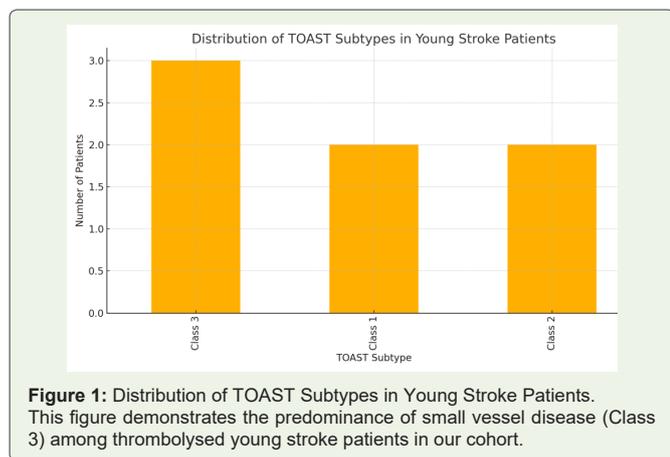
Stroke remains one of the leading causes of mortality and long-term disability worldwide, particularly in low- and middle-income countries (LMICs) like India. Acute ischemic stroke (AIS) constitutes the majority of all stroke cases, and intravenous thrombolysis (IVT) with recombinant tissue plasminogen activator (rtPA) has been shown to significantly improve outcomes when administered within the therapeutic window.

Despite well-established national and international guidelines, thrombolysis is underutilized in India due to delays in hospital arrival, lack of awareness, diagnostic limitations, and resource constraints. Regional audits are essential to understand local challenges and outcomes. Furthermore, young stroke—a distinct clinical subset defined as stroke occurring before the age of 50—presents unique etiologies such as vasculitis, arterial dissection, and thrombophilias, and demands tailored strategies.

This study combines a clinical audit of all thrombolysed AIS patients at our tertiary care stroke center with a detailed subgroup analysis of young stroke patients. Our objective was to evaluate the demographic, clinical, and radiological features, etiological subtypes, and early functional outcomes, particularly focusing on the implications of IVT in young adults.

**Materials and Methods**

**Study Design and Setting:** This was a retrospective observational study conducted at the Department of Neurology, Gauhati Medical College and Hospital (GMCH), Guwahati, Assam. The study analyzed patients treated between January 2023 and December 2024.



**Figure 1:** Distribution of TOAST Subtypes in Young Stroke Patients. This figure demonstrates the predominance of small vessel disease (Class 3) among thrombolysed young stroke patients in our cohort.

**Table 1:** Clinical Profile of Thrombolysed Young Stroke Patients

Age	Gender	HTN	T2DM	Valvular Heart Disease	MCA Territory	TOAST Subtype	NIHSS Pre-Thrombolysis	mRS	Mortality
37	Male	No	No	Yes	Yes	Class 3	12	0	No
48	Male	Yes	No	No	Yes	Class 1	19	Death	Yes
48	Female	No	No	Yes	Yes	Class 2	16	2	No
36	Female	No	No	Yes	Yes	Class 2	13	0	No
48	Male	Yes	Yes	No	Yes	Class 3	12	0	No
48	Female	Yes	Yes	No	Yes	Class 3	6	0	No
41	Female	Yes	Yes	No	Yes	Class 1	19	Death	Yes

**Study Population**

Out of 444 patients admitted with acute ischemic stroke (AIS), 29 patients received intravenous thrombolysis. Of these, 7 were under the age of 50 and were analyzed separately as the young stroke subgroup.

**Data Collection**

Clinical records were reviewed to collect demographic variables, vascular risk factors (hypertension, diabetes, valvular heart disease), infarct territory, TOAST classification, pre- and post-thrombolysis National Institutes of Health Stroke Scale (NIHSS), modified Rankin Scale (mRS) scores at discharge, and in-hospital mortality.

**Definitions**

- Young stroke: Age less than 50 years.
- Favorable outcome: Defined as mRS ≤2 at discharge.
- TOAST classification: Used for etiological subtyping (large artery atherosclerosis, cardioembolism, small vessel occlusion, other determined cause, and undetermined cause).

**Statistical Analysis**

Descriptive statistics were used to summarize data. Categorical variables were presented as frequencies and percentages; continuous variables as means or medians with ranges. No inferential statistics were applied due to the small sample size.

**Results**

Among the 444 ischemic stroke patients admitted during the study period, 29 received intravenous thrombolysis. Of these, 62% were male. The median NIHSS score at admission was 15 (range 5–32). Middle cerebral artery (MCA) territory involvement was universal (100%), followed by posterior cerebral artery (PCA) in 38% and anterior cerebral artery (ACA) in 10%. Post-thrombolysis improvement in NIHSS was observed in 82.7% of patients. Overall, 62% achieved favorable outcomes (mRS ≤2), while 17.2% (n=5) died during hospital stay—primarily due to hemorrhagic transformation or sepsis.

In the young stroke subgroup (n=7), mean age was 43.7 years with a slight female preponderance (M: F = 3:4). The most common etiological subtype was small vessel disease (TOAST Class 3), and MCA involvement was seen in all cases. Favorable outcome was achieved in 57.1% (n=4) and mortality in 28.6% (n=2). Valvular heart disease was present in 3 patients.

## Discussion

Our study highlights the clinical profile, etiological subtypes, and outcomes of thrombolysed AIS patients in a tertiary care center in Northeast India. A key observation was the predominance of MCA infarctions across the cohort. Favorable functional outcomes (mRS  $\leq 2$ ) were achieved in 62% of patients, consistent with prior Indian and global studies demonstrating the effectiveness of timely IVT [1–4]. The mortality rate of 17.2% in our cohort is within expected ranges, although room for improvement persists.

The young stroke subgroup represents a unique population. While stroke in younger individuals is less common, it has distinct etiological contributors including small vessel disease, cardioembolism, and vasculitis. In our cohort, small vessel disease was the leading etiology (TOAST Class 3). Notably, despite younger age and fewer comorbidities, mortality in this group was 28.6%, underlining the need for targeted preventive strategies and earlier identification.

Valvular heart disease in three of seven young stroke cases reinforces the need for echocardiographic screening in selected patients. Previous Indian series have similarly emphasized cardioembolic contributions in young stroke [5,6]. The functional outcome profile among young stroke patients in our audit was moderately favorable, aligning with existing literature [7,8].

Another important observation is the high proportion of patients presenting within the thrombolysis window—highlighting improving awareness and pre-hospital care. However, logistical barriers like delayed imaging and financial constraints still hinder broader implementation, consistent with other Indian data [9,10].

## Conclusion

Intravenous thrombolysis significantly improves early neurological outcomes in AIS patients. In this single-center experience from Northeast India, MCA strokes predominated and outcomes were generally favorable with early intervention. Stroke in young adults, although comprising a small subset, poses unique challenges and outcomes. Regional audits like ours are vital to inform health policy, optimize acute stroke care delivery, and drive public awareness.

## Declarations

Funding: Not applicable.

**Ethics Approval and Consent to Participate:** This was a retrospective audit of anonymized data; formal approval was waived.

**Consent for Publication:** Not applicable.

**Competing Interests:** The authors declare that they have no competing interests.

**Availability of Data and Materials:** Available from the corresponding author upon reasonable request.

**Author Contributions:** Dr. Akshay Bhutada: Conceptualization, data curation, formal analysis, and manuscript preparation.

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