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Original Research Article

Stroke in Young Adult: Clinical Profile, Risk Factors & Etiological Profile in ESIC MCH Bihta, Bihar

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Abstract:

Background: Stroke in young adults is an emerging public health issue associated with significant socioeconomic burden. The etiological spectrum and risk factor profile in younger populations differ from those in older individuals and vary across regions. Limited data are available from eastern India regarding the clinical and etiological characteristics of young stroke patients.

Objectives: To evaluate the clinical profile, risk factors, and etiological patterns of stroke in young adults admitted to a tertiary care hospital in Bihar.

Methods: This prospective observational study was conducted over eight months at ESIC Medical College and Hospital, Bihta, Patna. Fifty patients aged 20–50 years with radiologically confirmed stroke were included. Detailed clinical evaluation, laboratory investigations, and neuroimaging were performed. Ischemic strokes were etiologically classified based on standard criteria. Data were analyzed using descriptive statistics.

Results: The mean age of patients was 34.6 ± 6.8 years, with male predominance (58.0%). Ischemic stroke accounted for 74.0% of cases, while hemorrhagic stroke constituted 26.0%. Hypertension was the most common risk factor (50.0%), followed by smoking (42.0%) and alcohol consumption (38.0%). Among ischemic strokes, large artery atherosclerosis (27.0%) and cardioembolic causes (24.3%) were the leading etiologies. At discharge, 66.0% of patients showed clinical improvement, while in-hospital mortality was 4.0%.

Conclusion: Stroke in young adults is predominantly ischemic in nature and largely associated with modifiable vascular risk factors. The growing contribution of atherosclerotic and cardioembolic mechanisms highlights the need for early risk factor screening and preventive strategies in younger populations.

Keywords: Young stroke, ischemic stroke, risk factors, etiology, clinical profile, Bihar.

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Introduction

Stroke is traditionally considered a disease of the elderly; however, an increasing incidence among young adults has emerged as a significant public health concern worldwide [1]. Young adult stroke, commonly defined as occurring between 20 and 50 years of age, contributes substantially to long-term disability, loss of productivity, and psychosocial burden during the most economically active phase of life [2]. In low- and middle-income countries such as India, the burden appears disproportionately high, driven by demographic transition, urbanization, and rising prevalence of modifiable vascular risk factors [3].

Epidemiological data suggest that nearly 10–15% of all strokes occur in younger populations, with higher mortality and recurrence rates in developing regions compared to high-income countries [4]. Unlike elderly stroke, which is largely attributed to atherosclerosis and atrial fibrillation, stroke in young adults demonstrates a diverse etiological spectrum, including cardioembolic disorders, arterial dissections, prothrombotic states, vasculitis, infectious causes, and lifestyle-related risk factors such as smoking, alcohol use, obesity, and substance abuse [5,6]. This heterogeneity poses diagnostic and therapeutic challenges, necessitating comprehensive evaluation for accurate etiological classification.

Hypertension, diabetes mellitus, dyslipidemia, and smoking remain major modifiable risk factors even in younger individuals, reflecting the early onset of non-communicable diseases in the Indian population [7]. Additionally, region-specific contributors such as rheumatic heart disease, tuberculosis-associated vasculopathy, and hypercoagulable states linked to infections continue to play a role in South Asia [8]. Socioeconomic disparities, delayed hospital presentation, and limited access to advanced

diagnostic facilities further compound poor outcomes in resource-limited settings.

Despite the rising incidence, data on the clinical profile and etiological patterns of stroke in young adults from eastern India remain limited. Most available studies are derived from metropolitan tertiary centers, which may not accurately represent the rural and semi-urban populations served by government institutions. Understanding the local risk factor distribution and stroke subtypes is essential for developing targeted preventive strategies and optimizing management protocols.

Therefore, this study aims to evaluate the clinical presentation, risk factors, and etiological profile of stroke in young adults admitted to ESIC Medical College and Hospital, Bihta, Bihar, over an eight-month period. By analyzing 50 patients, this research seeks to provide region-specific insights into the burden of young stroke and contribute to improved early detection, prevention, and outcome-focused care in this vulnerable population.

Materials and Methods

Study Design: This was a hospital-based prospective observational study conducted to evaluate the clinical profile, risk factors, and etiological patterns of stroke in young adults.

Study Setting: The study was carried out at the Department of Medicine, ESIC Medical College and Hospital (ESIC MCH), Bihta, Patna, Bihar, a tertiary care referral center catering to urban and rural populations.

Study Duration: The study was conducted over a period of eight months.

Study Population: Young adult patients aged 20 to 50 years admitted with a diagnosis of acute stroke were included in the study. A total of 50 patients fulfilling the inclusion criteria were enrolled consecutively during the study period.

Inclusion Criteria

1. Patients aged between 20 and 50 years
2. Both male and female patients
3. Clinically diagnosed cases of acute stroke confirmed by neuroimaging (CT scan and/or MRI brain)
4. Patients providing informed consent or consent obtained from relatives when necessary

Exclusion Criteria

1. Patients aged above 50 years
2. Stroke due to trauma, brain tumors, or intracranial infections
3. Patients with transient ischemic attack (TIA)
4. Incomplete clinical or investigation data

Data Collection: Detailed clinical history was obtained, including demographic profile, presenting symptoms, duration of illness, and known vascular risk factors such as hypertension, diabetes mellitus, smoking, alcohol consumption, dyslipidemia, prior stroke, cardiac disease, and family history of cerebrovascular disease.

A thorough general and neurological examination was performed for all patients.

Laboratory Investigations: All patients underwent routine hematological and biochemical investigations including complete blood count, fasting blood glucose, renal function tests, lipid profile, serum electrolytes, and coagulation profile.

Additional investigations such as echocardiography, carotid Doppler ultrasonography, electrocardiography, and autoimmune or thrombophilia screening were performed when clinically indicated.

Neuroimaging: All patients underwent neuroimaging using non-contrast CT scan of the brain and/or MRI brain to confirm the diagnosis and classify stroke as ischemic or hemorrhagic.

Etiological Classification: Ischemic strokes were classified according to standard etiological criteria based on clinical findings, imaging, and ancillary investigations into large artery atherosclerosis, cardioembolic, small vessel disease, other determined causes, and undetermined causes.

Outcome Measures: Primary outcomes included clinical presentation patterns, distribution of risk factors, and etiological subtypes of stroke in young adults.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using statistical software. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Appropriate statistical tests were applied, with a p-value <0.05 considered statistically significant.

Results

A total of 50 young adult patients aged between 20 and 50 years diagnosed with acute stroke were included in the study. The mean age of the study population was 34.6 ± 6.8 years. The highest proportion of patients belonged to the 40–50 years age group (38.0%). Males predominated, accounting for 58.0% of cases, with a male-to-female ratio of 1.4:1 (Table 1).

Table 1: Demographic Characteristics of Patients (n = 50)

Variable	Number	Percentage (%)
Age group (years)		
20–29	9	18.0
30–39	19	38.0
40–50	22	44.0
Gender		
Male	29	58.0
Female	21	42.0

The most common presenting manifestation was hemiparesis or hemiplegia observed in 78.0% of patients, followed by speech disturbance (52.0%). Altered sensorium was noted in 28% of cases. Other symptoms included headache, vomiting, and seizures (Table 2).

Table 2: Clinical Presentation of Stroke Patients

Symptom	Number	Percentage (%)
Hemiparesis/hemiplegia	39	78.0
Speech disturbance	26	52.0
Altered consciousness	14	28.0
Headache	12	24.0
Vomiting	10	20.0
Seizures	8	16.0

Neuroimaging revealed that ischemic stroke was the predominant type, affecting 37 patients (74.0%), while hemorrhagic stroke was seen in 13 patients (26.0%) (Table 3).

Table 3: Distribution of Stroke Type

Stroke Type	Number	Percentage (%)
Ischemic	37	74.0
Hemorrhagic	13	26.0

Assessment of vascular and lifestyle risk factors showed hypertension as the most prevalent risk factor (50.0%), followed by smoking (42.0%) and alcohol consumption (38.0%). Dyslipidemia was present in 28% of patients, while diabetes mellitus was observed in 24% (Table 4).

Table 4: Risk Factors Among Patients

Risk Factor	Number	Percentage (%)
Hypertension	25	50.0
Smoking	21	42.0
Alcohol use	19	38.0
Dyslipidemia	14	28.0
Diabetes mellitus	12	24.0
Cardiac disease	8	16.0
Family history	6	12.0

Among the 37 ischemic stroke patients, large artery atherosclerosis was the most frequent etiology (27.0%), followed by cardioembolic causes (24.3%) and small vessel disease (21.6%). Other determined causes accounted for 16.2% of cases, while 10.8% remained undetermined (Table 5).

Table 5: Etiological Profile of Ischemic Stroke (n = 37)

Etiology	Number	Percentage (%)
Large artery atherosclerosis	10	27.0
Cardioembolic	9	24.3
Small vessel disease	8	21.6
Other causes	6	16.2
Undetermined	4	10.8

At the time of discharge, 66.0% of patients showed clinical improvement, while 22.0% had no significant change. Deterioration occurred in 8.0% of cases, and in-hospital mortality was 4.0% (Table 6).

Table 6: Clinical Outcome at Discharge

Outcome	Number	Percentage (%)
Improved	33	66.0
No change	11	22.0
Deteriorated	4	8.0
Death	2	4.0

Discussion

The present study evaluated the clinical characteristics, risk factors, and etiological profile of stroke in young adults admitted to a tertiary care center in Bihar. The predominance of patients in the 40–50 year age group and the higher proportion of males observed in this study are consistent with findings reported across multiple Indian cohorts, reflecting greater exposure of males to modifiable lifestyle risk factors such as smoking and alcohol consumption [9,10].

Ischemic stroke constituted nearly three-quarters of cases in the present study, which aligns with previous studies from India reporting ischemic stroke as the dominant subtype among young adults [11]. Hemorrhagic strokes, though less frequent, accounted for a significant proportion, likely influenced by poor blood pressure control and delayed healthcare access in rural populations.

Hypertension emerged as the most common risk factor in this study, present in more than half of the patients. Similar high prevalence has been reported by other Indian researchers, highlighting early onset of vascular risk factors in younger populations [12]. Smoking and alcohol consumption were also prevalent, reinforcing their strong association with cerebrovascular events in young adults [13]. The notable presence of dyslipidemia and diabetes mellitus further emphasizes the growing burden of metabolic disorders contributing to premature vascular disease.

The etiological distribution of ischemic stroke revealed large artery atherosclerosis and cardioembolic causes as the most frequent mechanisms. This pattern parallels observations from multicenter Indian studies that document a transition from traditional causes such as rheumatic heart disease to atherosclerotic and embolic etiologies [14]. Small vessel disease also constituted a substantial proportion, indicating the impact of chronic hypertension and metabolic syndrome even at a young age.

A considerable fraction of patients fell under other determined or undetermined causes, underscoring the diagnostic complexity of young stroke. Previous literature has emphasized the role of hypercoagulable states, vasculitis, arterial dissection, and infectious etiologies in this age group, particularly in developing regions [15]. Limited availability of advanced thrombophilia and genetic testing may have contributed to the proportion of undetermined cases in the present study.

Clinical outcomes in this cohort were generally favorable, with over two-thirds of patients showing improvement at discharge. Comparable outcome patterns have been reported in earlier Indian studies, attributing better recovery in young stroke patients to greater neuroplasticity and fewer comorbidities [16]. However, the presence of mortality and clinical deterioration highlights the need for early recognition and aggressive management.

Overall, the findings of this study reinforce that stroke in young adults is largely driven by preventable risk factors and evolving vascular etiologies. Targeted public health interventions focusing on blood pressure control, lifestyle modification, and early cardiovascular screening in younger populations are essential to reduce the growing burden of young stroke in India.

Conclusion

Stroke among young adults represents a significant and increasing health burden in the Indian population. The present study demonstrates that ischemic stroke is the predominant subtype in this age group, with hypertension, smoking, and alcohol consumption being the most prevalent risk factors. The etiological pattern reflects a transition toward atherosclerotic and cardioembolic mechanisms, indicating early onset of vascular disease in younger individuals.

The findings emphasize that a large proportion of young stroke cases are potentially preventable through effective control of modifiable risk factors. Early detection of hypertension, lifestyle modification, management of metabolic disorders, and public health awareness programs targeting younger populations are crucial in reducing stroke incidence and associated disability.

Furthermore, comprehensive etiological evaluation should be encouraged to guide appropriate secondary prevention strategies. Strengthening

primary healthcare systems and improving access to timely stroke care in rural and semi-urban regions will play a vital role in improving outcomes.

Overall, this study provides valuable region-specific data that can contribute to improved preventive policies and clinical management of stroke in young adults in eastern India.

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