



Clinical profile and risk factors of ischemic stroke in adults: a cross-sectional observational study at a tertiary care hospital.

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Abstract

Background:

Ischemic stroke continues to be a major cause of long-term disability and mortality in low- and middle-income regions. Identifying clinical patterns and modifiable vascular risks in affected adults is essential for strengthening preventive strategies and improving early outcomes in tertiary-care settings.

Objectives:

To describe the demographic profile, clinical presentation, vascular risk factors, imaging characteristics, and early in-hospital outcomes of adults diagnosed with ischemic stroke.

Methods:

This observational study enrolled **100 adults** with radiologically confirmed ischemic stroke. Detailed demographic information, risk-factor distribution, presenting symptoms, NIHSS scores, stroke territory, and imaging etiology were recorded. Carotid Doppler findings, metabolic parameters, and early complications were documented. Functional recovery at discharge was assessed using the modified Rankin Scale (mRS). Data were summarized using descriptive statistics, with results organized in Tables 1–4.

Results:

The mean age was 61.8 ± 11.4 years, and males represented 64% of the cohort. The majority belonged to the 56–70-year age group. Hypertension (68%), diabetes (44%), and dyslipidemia (38%) were the most frequent vascular risks. Nearly one-third exhibited multiple coexisting risk factors. Anterior circulation strokes accounted for 72%, with motor weakness reported by 84% of patients. The median NIHSS score at admission was 10. Imaging revealed large-artery atherosclerotic infarcts in 47%, lacunar strokes in 28%, and cardioembolic events in 15%. Carotid Doppler detected $\geq 50\%$ stenosis in 22%. Early complications included aspiration pneumonia (12%) and cerebral edema (9%). Functional improvement ($mRS \leq 3$) was noted in 58%, while in-hospital mortality was 6%.

Conclusion:

The findings highlight a strong clustering of modifiable vascular risks, predominance of anterior circulation involvement, and considerable early morbidity. Timely detection of hypertension, glycaemic derangements, and carotid disease may substantially improve clinical outcomes.

Recommendations:

Regular community-based screening for hypertension, diabetes, and dyslipidemia should be strengthened. Primary-care providers require structured training to recognize early stroke symptoms and expedite referral.

Keywords: ischemic stroke; vascular risk factors; clinical profile; carotid stenosis; anterior circulation infarct; National Institutes of Health Stroke Scale.

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Introduction

Ischemic stroke remains one of the most pressing public health challenges worldwide, contributing substantially to adult morbidity, long-term disability, and premature mortality [1,2]. Its burden is particularly pronounced in low- and middle-income countries, where demographic transition, rising cardiovascular risk factors, and uneven access to preventive care have intensified its clinical and socioeconomic impact [3,4]. The condition typically results from a reduction in cerebral blood flow caused by arterial occlusion, leading to irreversible neuronal injury when timely intervention is delayed [5].

The global rise in stroke incidence parallels the expanding prevalence of hypertension, diabetes mellitus, dyslipidemia, smoking, and sedentary lifestyles, all of which are well-established contributors to ischemic injury [3–4]. These modifiable determinants often coexist, accelerating vascular damage and undermining cerebrovascular resilience. Although the biological mechanisms underlying ischemic injury are well recognized, the clinical profile of affected individuals varies considerably across regions due to differences in environmental exposures, healthcare-seeking behavior, and availability of diagnostic tools. Understanding these regional patterns is essential for tailoring preventive and therapeutic strategies.

In many tertiary-care settings across India, adults continue to present late in the course of ischemic stroke, frequently with multiple unrecognized risk factors, which limit opportunities for timely reperfusion therapies and contribute to poor outcomes [5,6]. Detailed characterization of clinical symptoms, vascular territory involvement, and early complications can offer valuable insights into gaps in community awareness, stroke pathways, and chronic disease control. Such evidence is vital for informing targeted screening programs and strengthening hospital-based management protocols.

Against this backdrop, the present study was undertaken to evaluate the demographic characteristics, vascular risk factors, presenting features, imaging patterns, and short-term outcomes of adults diagnosed with ischemic stroke in a tertiary-care hospital. By outlining the clinical spectrum and identifying dominant risk contributors, the study aims to support context-specific preventive strategies and enhance early stroke care delivery.

Methodology

Study Setting

This observational study was conducted in the Department of General Medicine, Government General Hospital (GGH), Bhadradi Kothagudem, Telangana. The study spanned one year, from May 2024 to April 2025, and included all consecutive adults presenting with features suggestive of acute ischemic stroke and confirmed through neuroimaging.

Study Design and Participants

A hospital-based, cross-sectional observational design was adopted. Adults aged **18 years and above** with a diagnosis of ischemic stroke confirmed by **CT or MRI of the brain** were eligible. Patients with hemorrhagic stroke, traumatic brain injury, space-occupying lesions, and metabolic encephalopathy were excluded to ensure sample uniformity.

Study size

The study included 100 adult patients with radiologically confirmed ischemic stroke. The sample size was determined based on the number of eligible cases presenting to the Department of General Medicine, Government General Hospital, Bhadradi Kothagudem, during the defined one-year study period from May 2024 to April 2025. As this was a hospital-based observational study with descriptive objectives, a sample of 100 participants was considered adequate to describe the demographic profile, clinical presentation, vascular risk-factor distribution, imaging patterns, and early in-hospital outcomes. Consecutive enrolment was followed until the planned sample size was achieved.

Data Collection

After obtaining informed consent, detailed demographic information, including age, sex, and relevant clinical history, was recorded. The presence of vascular risk factors such as hypertension, type 2 diabetes mellitus, dyslipidemia, smoking, alcohol use, atrial fibrillation, and previous stroke or transient ischemic attack was documented through patient interviews, clinical records, and laboratory reports.

Clinical Assessment

All participants underwent a systematic neurological evaluation at admission. Stroke severity was graded using the **National Institutes of Health Stroke Scale (NIHSS)**. Presenting symptoms, including motor deficits, speech impairment, facial deviation,



sensory loss, and altered sensorium, were noted. Stroke territory involvement (anterior vs. posterior circulation) was identified based on radiological findings.

Investigations

Imaging studies included **CT or MRI of the brain** for stroke confirmation and classification. Etiological patterns were categorized as large-artery atherosclerosis, small-vessel lacunar infarction, cardioembolism, or undetermined type. **Carotid Doppler ultrasonography** was performed to assess stenosis. In diabetic patients, **HbA1c levels** were measured to evaluate long-term glycaemic status.

Outcome Measures

Early in-hospital complications such as aspiration pneumonia, cerebral edema, and urinary tract infections were monitored. Functional recovery at discharge was assessed using the **modified Rankin Scale (mRS)**, with scores ≤ 3 considered indicative of meaningful improvement.

Bias

To minimize selection bias, all consecutive eligible adult patients presenting with clinical features of ischemic stroke during the study period were considered for inclusion. Only patients with ischemic stroke confirmed by CT or MRI of the brain were enrolled, thereby reducing diagnostic misclassification. Uniform inclusion and exclusion criteria were applied to all participants. Information on demographic profile, clinical presentation, vascular risk factors, laboratory findings, imaging characteristics, and in-hospital outcomes was collected using a structured data collection format. Clinical assessment was performed systematically, and stroke severity was graded using the National Institutes of Health Stroke Scale to reduce observer-related variability. Data were verified from clinical records, laboratory reports, and imaging findings wherever applicable. Patients with hemorrhagic stroke, traumatic brain injury, space-occupying

lesions, and metabolic encephalopathy were excluded to maintain sample homogeneity and limit confounding.

Statistical Analysis

Data were compiled and analyzed using standard descriptive statistics. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as means with standard deviations.

Ethical considerations

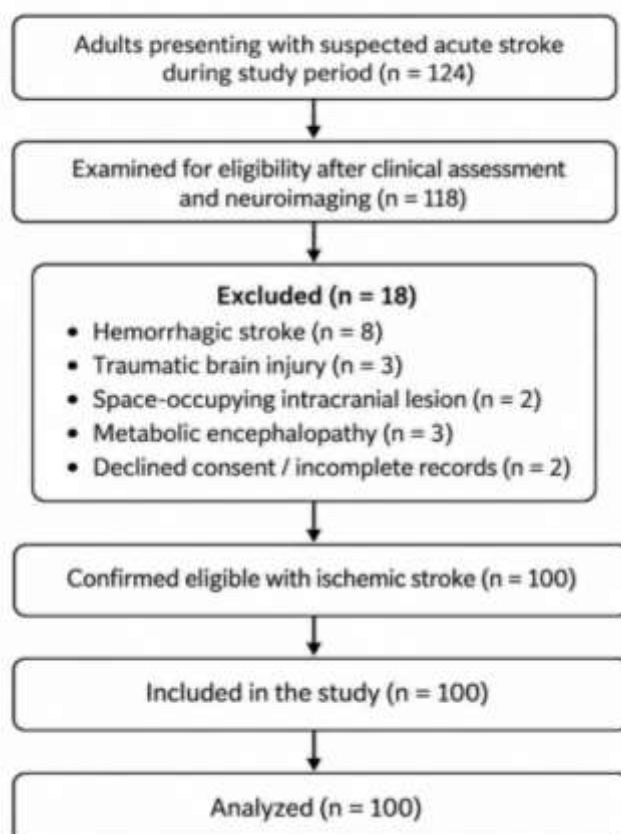
The study was conducted after obtaining approval from the Institutional Ethics Committee, Government Medical College and General Hospital, Bhadradri Kothagudem, Telangana, India. Written informed consent was obtained from all participants or their legally acceptable representatives before enrolment. Patient confidentiality was strictly maintained throughout data collection, analysis, and manuscript preparation.

Results

Participant flow

During the one-year study period, 124 adults presenting with clinical features suggestive of acute stroke were initially identified at the Department of General Medicine, Government General Hospital, Bhadradri Kothagudem. Of these, 118 patients were examined for eligibility after preliminary clinical assessment and neuroimaging. Eighteen patients were excluded because they did not meet the study criteria: 8 had hemorrhagic stroke, 3 had traumatic brain injury, 2 had space-occupying intracranial lesions, 3 had metabolic encephalopathy, and 2 either declined consent or had incomplete essential clinical records. Finally, 100 adults with CT- or MRI-confirmed ischemic stroke were included in the study. All 100 enrolled participants had complete baseline clinical, risk-factor, imaging, and in-hospital outcome data and were included in the final analysis. This participant flow is consistent with the final analyzed sample of 100 adults reported in the study.

Figure 1. Participant flow diagram of adults screened and included in the ischemic stroke study.



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A total of 100 adults with ischemic stroke were evaluated in this study. The demographic distribution is summarized in Table 1. The mean age of the cohort was 61.8 ± 11.4 years, with nearly half of the participants belonging to the 56–70-year range.

Individuals aged above 70 years constituted 22%, while 18% were younger than 50 years. Males accounted for 64% of the study population, yielding a male-to-female ratio of 1.8:1.

Table 1. Demographic Characteristics of Adults with Ischemic Stroke (n = 100)

Variable	Category	n (%) / Mean $\pm$ SD
Age (years)	Mean $\pm$ SD	61.8 $\pm$ 11.4
	<50 years	18 (18%)
	50–55 years	14 (14%)
	56–70 years	46 (46%)
	>70 years	22 (22%)
Gender	Male	64 (64%)
	Female	36 (36%)
Male : Female ratio	—	1.8 : 1

The burden of vascular risk factors is detailed in Table 2. Hypertension was the most prevalent factor (68%), followed by type 2 diabetes mellitus (44%) and dyslipidemia (38%). Tobacco exposure, either

current or past, was reported by 36%, whereas alcohol consumption was noted in 29%. Atrial fibrillation was observed in 11%, and 14% had experienced a previous stroke or transient ischemic

attack. Importantly, 32% of participants exhibited two or more concurrent risk factors, reflecting significant cumulative vascular vulnerability.

Table 2. Distribution of Vascular Risk Factors (n = 100)

Risk Factor	n (%)
Hypertension	68 (68%)
Type 2 diabetes mellitus	44 (44%)
Dyslipidemia	38 (38%)
Current/past smoking	36 (36%)
Alcohol consumption	29 (29%)
Atrial fibrillation	11 (11%)
Previous stroke/TIA	14 (14%)
≥2 risk factors present	32 (32%)

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Clinical patterns and presenting features are outlined in Table 3. Anterior circulation strokes predominated (72%), with the MCA territory being the most affected. Posterior circulation involvement accounted for 28%. Motor weakness was the leading

symptom (84%), followed by speech impairment (52%), facial deviation (46%), sensory deficits (31%), and altered sensorium (18%). The median NIHSS score at admission was 10, and 41% of patients presented with moderate stroke severity.

Table 3. Clinical Presentation and Stroke Patterns (n = 100)

Parameter	Category	n (%)
Stroke Territory	Anterior circulation	72 (72%)
	Posterior circulation	28 (28%)
Presenting Symptoms	Motor weakness	84 (84%)
	Speech impairment	52 (52%)
	Facial deviation	46 (46%)
	Sensory deficits	31 (31%)
	Altered sensorium	18 (18%)
NIHSS Score	Median score	10
	Moderate (NIHSS 5–15)	41 (41%)

Neuroimaging and in-hospital outcomes are presented in Table 4. Nearly half of the cases demonstrated large-artery atherosclerotic infarcts (47%), whereas small-vessel lacunar infarcts were noted in 28%. Cardioembolic strokes constituted 15%, and 10% remained of undetermined etiology. Carotid Doppler indicated ≥50% stenosis in 22% of

participants. Among diabetic individuals, 58% had HbA1c levels above 7.5%, reflecting prolonged metabolic imbalance. Early complications included aspiration pneumonia (12%), cerebral edema (9%), and urinary tract infections (7%). Overall, 58% achieved functional improvement at discharge (mRS ≤3), and the in-hospital mortality rate was 6%.

Table 4. Imaging Findings, Complications, and In-Hospital Outcomes (n = 100)

Parameter	Category	n (%)
Imaging Etiology	Large-artery atherosclerotic infarcts	47 (47%)
	Small-vessel lacunar infarcts	28 (28%)
	Cardioembolic infarcts	15 (15%)
	Undetermined etiology	10 (10%)
Carotid Doppler	≥50% stenosis	22 (22%)



Glycaemic Status in Diabetics	HbA1c > 7.5%	26 of 44 (58%)
Early Complications	Aspiration pneumonia	12 (12%)
	Cerebral edema	9 (9%)
	UTI	7 (7%)
Outcomes	Functional improvement at discharge (mRS ≤3)	58 (58%)
	In-hospital mortality	6 (6%)

Discussion

This observational study provides an updated overview of the clinical profile and vascular risk distribution among adults diagnosed with ischemic stroke in a tertiary-care setting in Bhadradi Kothagudem. The predominance of ischemic stroke in older adults, with a mean age above 60 years, aligns with findings from large multicentric and regional studies, which consistently demonstrate increasing stroke incidence with advancing age [7,8]. The concentration of cases within the 56–70-year group mirrors national and international trends, emphasizing the rising burden of cerebrovascular disease in aging populations [9].

A striking feature of this cohort is the dominance of modifiable cardiovascular risks, particularly hypertension, diabetes mellitus, and dyslipidemia. Hypertension emerged as the leading contributor, a pattern also reported in studies from India, Ethiopia, and Ghana, where it remains the strongest predictor of ischemic stroke due to its cumulative vascular impact [8–11]. Nearly one-third of participants harbored multiple coexisting risk factors, reinforcing the concept of risk clustering, an established driver of accelerated cerebrovascular injury and recurrent stroke events [7,12]. The observed prevalence of smoking and alcohol use further reflects persisting lifestyle-related susceptibilities in this region.

The clinical presentation in this study aligns with the classical symptom constellation of ischemic stroke, with motor weakness, speech impairment, and facial deviation being dominant features similar to patterns documented in cohorts from South Asia and Africa [9–11]. The predominance of anterior circulation infarcts corresponds with the natural distribution of atherosclerotic occlusion in the carotid system. A median NIHSS score of 10 indicates moderate neurological deficits at admission, a finding consistent with young adult stroke studies and multicenter prospective analyses reporting comparable severity levels at presentation [10,12]. Imaging patterns further emphasize the prominence of large-artery atherosclerotic infarcts, reflecting the high burden of vascular risk factors in this population.

The proportion of lacunar strokes, representing small-vessel disease, corresponds with earlier studies that attribute such infarcts to uncontrolled hypertension and chronic microvascular injury [7,8,11]. Carotid Doppler evidence of ≥50% stenosis in more than one-fifth of patients underscores the need for systematic vascular screening, a recommendation supported by multicentric stroke subtype studies [12]. Elevated HbA1c levels in diabetic participants point to inadequate glycaemic control, a well-known aggravator of endothelial dysfunction and atherosclerotic progression documented in international cohorts [7,10].

Early complications such as aspiration pneumonia and cerebral edema highlight the importance of vigilant monitoring in the acute phase, as reported in other tertiary-care studies from Africa and South Asia [9,11]. Although the in-hospital mortality rate of 6% was relatively low, the substantial morbidity underscores the ongoing need for timely intervention. The observed functional improvement rate of 58% at discharge reflects the positive impact of coordinated multidisciplinary care, consistent with outcomes described in prospective stroke cohorts [12].

Generalizability

The findings of this study apply to similar tertiary-care settings serving mixed urban and semi-urban populations with a high burden of cardiovascular risk factors. The demographic and clinical trends observed reflect patterns commonly reported across Indian hospitals, enhancing external relevance. However, because the study was conducted at a single center with hospital-based recruitment, the results may not fully represent community-level stroke profiles or populations with differing healthcare access. Even so, the data offer valuable insights for regions with comparable epidemiological characteristics and service structures.

Conclusion

This study highlights the significant contribution of modifiable vascular risk factors to the burden of ischemic stroke among adults attending a tertiary-care hospital in Bhadradi Kothagudem.



Hypertension, diabetes, and dyslipidemia emerged as the dominant determinants, while a substantial proportion of individuals presented with multiple coexisting risks. Anterior circulation involvement and moderate neurological deficits were the most frequent clinical patterns, supported by imaging evidence of large-artery atherosclerosis and small-vessel disease. Early complications, though manageable, contributed to considerable morbidity. Strengthening preventive strategies, improving chronic disease control, and promoting rapid stroke recognition remain essential to enhance functional outcomes and reduce early mortality in similar healthcare settings.

Limitations

This study was conducted at a single tertiary-care center, limiting its ability to represent broader community patterns or populations with differing healthcare access. The hospital-based design captured only those who presented for treatment, excluding individuals with mild or unrecognized strokes. Imaging modalities were not uniform for all participants, creating variation in etiological classification. Long-term outcomes were not assessed, restricting understanding of recovery trajectories. The sample size, although adequate for descriptive analysis, restricts subgroup comparisons.

Recommendations

Strengthened community screening for hypertension, diabetes, and dyslipidemia is essential to curb early vascular damage. Primary-care teams should receive focused training to recognize warning signs of stroke and ensure rapid referral pathways. Public education campaigns must emphasize lifestyle modification, smoking cessation, and safe alcohol practices. Routine carotid Doppler evaluation should be considered for individuals with multiple cardiovascular risk factors. Hospitals need standardized stroke protocols to streamline assessment, imaging, and early rehabilitation. Follow-up programs offering counselling, medication adherence support, and physiotherapy can enhance long-term recovery and reduce recurrence. Multidisciplinary collaboration remains central to improving outcomes.

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Abbreviations

NIHSS – National Institutes of Health Stroke Scale
TIA – Transient Ischemic Attack
MCA – Middle Cerebral Artery
CT – Computed Tomography
MRI – Magnetic Resonance Imaging
mRS – Modified Rankin Scale
HbA1c – Glycated Hemoglobin
UTI – Urinary Tract Infection
GGH – Government General Hospital
AF – Atrial Fibrillation
LAA – Large-Artery Atherosclerosis
SVD – Small-Vessel Disease

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Conflict of interest

The authors declare no conflict of interest.

Author contributions

GL-Concept and design of the study, results interpretation, review of literature, and preparation of the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. -Concept and design of the study, results interpretation, review of literature, preparing the first draft of the manuscript, and revision of the manuscript. -Review of literature and preparing the first draft of the manuscript. Statistical analysis and interpretation.

Data availability

Data available on request

Author Biography

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