



**IN HOSPITAL OUTCOME AND ASSOCIATED FACTORS
AMONG ADULT ACUTE STROKE PATIENTS ADMITTED
TO WOLKITE UNIVERSITY SPECIALIZED HOSPITAL
FROM OCTOBER 2023 TO DECEMBER 2025: HOSPITAL-
BASED RETROSPECTIVE CROSS-SECTIONAL STUDY**

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In Hospital Outcome and Associated Factors Among Adult Acute Stroke Patients Admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025: Hospital-based retrospective cross-sectional study

Thesis Submitted to the School of Graduate Studies in Partial Fulfillment of the Requirements for the Certificate of Specialty in Internal Medicine.

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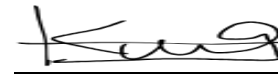
February, 2026

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APPROVAL SHEET


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DECLARATION

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ABBREVIATIONS AND ACRONYMS

ACEi: Angiotensin Converting Enzyme Inhibitors

AIS: Acute Ischemic Stroke

CI: Confidence Interval

CT: Computed Tomography

DBP: Diastolic Blood Pressure

DVT: Deep Vein Thrombosis

Dx: Diagnosis

GCS: Glasgow Coma Scale

HIC: High Income Countries

ICU: Intensive Care Unit

ICH: Intracranial Hemorrhage

LMICs: Low- and Middle-Income Countries

MRI: Magnetic resonance imaging

mRS: Modified Rankin Scale

NCDs: Non-Communicable Diseases

NIHSS-National Institute of Health Stroke Scale

PTE: Pulmonary thromboembolism

SAH: Subarachnoid Hemorrhage

SBP: Systolic Blood Pressure

SPSS: Statistical Package for the Social Sciences

TIA: Transient Ischemic Attack

WHO: World Health Organization

WKUSH: Wolkite University Specialized Hospital

WSO: World Stroke Organization

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ABSTRACT

Background: Stroke is a leading cause of morbidity and mortality in low- and middle-income countries, including Ethiopia. However, evidence on in-hospital treatment patterns, complications, and predictors of outcome among hospitalized stroke patients remains limited.

Methods: A hospital-based retrospective study was conducted among patients admitted with acute stroke. Data on socio-demographic characteristics, vascular risk factors, clinical presentation, laboratory and imaging findings, in-hospital treatment, complications, and outcomes were collected and analyzed. Multivariable logistic regression analysis was performed to identify independent predictors of poor in-hospital outcomes.

Results: A total of 236 patients admitted with acute stroke were included in the study. The mean age was 62.1 ± 13.7 years, with a slight male predominance (51.7%). Hypertension (67.8%) was the most common risk factor, and most patients presented late after symptom onset. Ischemic stroke accounted for 59.3% of cases. Overall, 41.1% of patients experienced a poor outcome, including clinical deterioration (28.0%) and death (12.3%). In multivariable analysis, moderate to severe impairment of consciousness at admission (AOR = 6.98; $p < 0.001$), higher admission RBS (AOR = 2.26; $p = 0.032$), renal dysfunction (AOR = 2.87; $p = 0.016$), delayed blood pressure management (AOR = 2.89; $p = 0.041$), and prolonged hospital stay (AOR 3.12; $p = 0.008$) were independent predictors

Conclusion: Poor in-hospital outcomes among stroke patients remain substantial. Admission neurological status and random blood sugar, renal dysfunction, delayed blood pressure management, and prolonged hospitalization are key associated factors of adverse outcomes, highlighting the need for early risk stratification and comprehensive inpatient care in resource-limited settings.

Keywords: Stroke; In-hospital outcome; predictors; Wolkite; Ethiopia; Low-income countries

1. INTRODUCTION

1.1 Background of the Study

A stroke is a medical emergency that occurs when blood flow to the brain is interrupted, either due to a blockage or bleeding. This lack of blood flow can lead to brain cell death and serious complications that can be fatal and need immediate treatment.(1)

It is broadly categorized into ischemic stroke, resulting from interruption of cerebral blood flow, and hemorrhagic stroke, caused by rupture of intracranial vessels(2). Ischemic stroke accounts for the majority of cases globally, while hemorrhagic stroke contributes substantially to early mortality and severe disability(3).

Globally, stroke is one of the leading causes of death and long-term disability. It ranks as the second leading cause of mortality worldwide and is a major contributor to disability-adjusted life years (DALYs). Each year, millions of individuals experience new stroke events, and a large proportion either die or survive with permanent neurological deficits(3). The burden of stroke is disproportionately concentrated in low- and middle-income countries (LMICs), where more than two-thirds of stroke-related deaths occur(2,4).

Over recent decades, high-income countries have achieved reductions in stroke mortality through improved primary prevention, rapid diagnosis, organized stroke unit care, and access to reperfusion therapies(5). In contrast, many LMICs continue to face increasing stroke incidence and higher case fatality rates, largely due to demographic transitions, urbanization, and rising prevalence of vascular risk factors such as hypertension and diabetes mellitus.

Sub-Saharan Africa has experienced a notable rise in stroke burden, with patients often presenting at younger ages and with more severe disease compared to high-income settings. Limited access to early neuroimaging, absence of structured stroke units, delayed hospital arrival, and insufficient rehabilitation services contribute to adverse outcomes(5,6).

In Ethiopia, stroke represents a growing cause of hospital admission and mortality. Hospital-based studies indicate that hypertension is present in more than 60% of stroke patients, and other comorbid conditions such as diabetes mellitus and atrial fibrillation are common(6,7).

Reported in-hospital mortality rates range from approximately 12% to over 30%, and a considerable proportion of survivors are discharged with significant functional impairment(6–8). Delayed presentation and in-hospital complications, such as aspiration pneumonia and raised intracranial pressure, further contribute to unfavorable outcomes(7,8).

Given the increasing burden of stroke and variability in healthcare resources across institutions, understanding treatment outcomes within specific hospital settings is important for contextualizing the magnitude of the problem.

1.2 Statement of the Problem

Stroke remains a major cause of in-hospital mortality and disability in Ethiopia. Despite global progress in acute stroke management, similar improvements in survival and functional recovery have not been consistently observed in many resource-limited settings(3,5).

In Ethiopian referral hospitals, in-hospital mortality among stroke patients has been reported to reach up to 30%, while unfavorable functional outcomes affect nearly one-third to one-half of admitted patients(6–8). These findings indicate a substantial magnitude of poor outcomes among hospitalized stroke patients.

Several clinical and systemic factors contribute to these adverse outcomes, including delayed hospital presentation, presence of comorbid conditions, reduced level of consciousness at admission, and development of in-hospital complications(6–8). Limited availability of organized stroke care services, absence of thrombolytic therapy in many centers, and gaps in early physiological monitoring further compound the problem.

Wolkite University Specialized Hospital serves a large catchment population in a region where access to specialized neurological services is limited. However, the magnitude of poor in-hospital outcomes and the associated clinical factors among acute stroke patients admitted to this hospital have not been clearly documented. Without institution-specific data, the pattern and determinants of stroke outcomes in this setting remain inadequately described.

Therefore, assessing the magnitude of poor treatment outcomes and identifying associated factors among acute stroke patients admitted to Wolkite University Specialized Hospital is necessary to characterize the burden within this institution.

1.3 Significance of the Study

The study will supply WKUSH clinicians and administrators with the first systematic, institution-specific data on stroke outcomes and associated factors. By quantifying the magnitude of in-hospital mortality and functional disability and identifying modifiable predictors, the study will enable targeted clinical changes and measurable quality-improvement initiatives.

Locally relevant evidence on outcome rates and drivers of poor prognosis will inform hospital management and other responsible authorities when allocating scarce resources (e.g., training, monitoring equipment, stroke-specific nursing/rehabilitation services). Findings may support the development or adaptation of stroke management guidelines appropriate to the facility level.

The study will also fill a gap in the scientific literature from the Gurage Zone and central Ethiopia and will contribute local data to national and regional syntheses of stroke outcomes. Results can be used as a baseline for future prospective or interventional research and for advocacy aimed at reducing stroke-related mortality and disability in similar low-resource settings

2. LITERATURE REVIEW

2.1 Stroke Burden and Outcomes in Ethiopia

Stroke represents a significant and growing cause of morbidity and mortality in Ethiopia. A 2021 systematic review and meta-analysis involving over 6,000 patients across the country reported a pooled prevalence of poor treatment outcomes (defined as death or significant disability) of 30.18% (9). The pooled in-hospital mortality rate was found to be 22.61% a figure substantially higher than that reported in HICs (9).

Regarding stroke subtypes, ischemic stroke remains more common than hemorrhagic stroke, consistent with global patterns. However, the proportion of hemorrhagic stroke in Ethiopian cohorts is often higher than in Western cohorts, which is significant because ICH is associated with a much higher early case-fatality rate (9,10). Survivors of stroke in Ethiopia face a high burden of disability. Studies from various hospitals, including Tikur Anbessa Specialized Hospital in Addis Ababa, consistently report that a large proportion of patients are discharged with severe functional dependence, requiring ongoing care from family members and placing a significant strain on social support systems (10,11). For instance, a key study conducted at Hawassa University Referral Hospital in Southern Ethiopia found an in-hospital mortality rate of 17.4%. In that setting, the most powerful predictors of mortality were a low Glasgow Coma Scale (GCS) score on admission and the development of aspiration pneumonia (12). Further research from the same institution highlighted that hypertension was the most prevalent risk factor, identified in 52.2% of stroke patients, and was significantly more common among those with hemorrhagic stroke compared to ischemic stroke(13).

2.2 Associated Factors of Outcomes

The outcome after a stroke is determined by a confluence of factors, which can be broadly categorized into patient-specific, clinical, and health-system determinants.

Patient and Clinical Determinants:

Stroke Severity at Admission: This is one of the most powerful and consistent predictors of outcome. It is commonly assessed using the Glasgow Coma Scale (GCS) for level of

consciousness and the National Institutes of Health Stroke Scale (NIHSS) for neurological deficit in ischemic stroke. A low GCS score (e.g., <8) or a high NIHSS score (e.g., >15) at presentation is strongly associated with increased mortality and poor functional outcome (14,15).

Stroke Subtype: As noted, hemorrhagic stroke, particularly large-volume intracerebral hemorrhage, carries a significantly higher risk of 30-day mortality compared to ischemic stroke. The presence of intraventricular extension of blood is an additional poor prognostic indicator (16,17).

Age: Advanced age is consistently associated with higher mortality and worse functional recovery after stroke, due to reduced physiological reserve and a higher burden of comorbidities (4,14).

Smoking: Smoking is frequently listed under “substance use” or “behavioral risk factors” across several Ethiopian cohort and cross-sectional studies. However, in many analyses, after adjusting for confounders, smoking alone often loses statistical significance as an independent predictor of poor outcomes. In the national meta-analysis of stroke treatment outcomes and associated factors, smoking was reported among prevalent risk factors. Still, it was not among the major adjusted predictors of poor functional or survival outcomes. Main predictors identified instead were illiteracy, hemorrhagic stroke type, delayed hospital arrival, and comorbidities(18).

Khat Chewing: Khat chewing appears as a common behavioral exposure in several regional studies. In the Ambo University Referral Hospital retrospective study, it was among substance abuse was significantly associated with poor treatment outcomes(7). Similarly, in the Hiwot Fana Comprehensive Specialized Hospital study, poor outcomes were observed more frequently among those with multiple risky behaviors(19)

Alcohol Consumption: Alcohol use is one of the most commonly reported lifestyle risk factors among stroke patients in Ethiopia. In multiple local studies and meta-analyses, alcohol is consistently mentioned among the most prevalent behavioral risk factors; however, few studies isolate its adjusted effect on outcomes independent of other risk factors(7,19)

Rural Residence: Socio-geographic disparities are repeatedly highlighted that rural residence was associated with an approximately three-fold higher 28-day mortality risk among stroke patients, compared to urban dwellers(20). Rural residence often co-occurs with low educational level and delayed arrival to hospital, contributing to higher disability and case-fatality rates(20).

Low Socioeconomic and Educational Status: Socioeconomic disadvantage and illiteracy are among the most powerful predictors of poor stroke outcomes. The Ethiopian 2025 meta-analysis found illiteracy to have extremely high odds of poor treatment outcome (AOR = 21.29; 95% CI \approx 20.59–22.00) in pooled data(6,18,20).

Laboratory Markers: Laboratory findings have been increasingly recognized as predictors of prognosis among Ethiopian stroke patients, particularly hyperglycemia and renal dysfunction. Hyperglycemia on admission, even in non-diabetic patients, is repeatedly associated with worse functional outcomes, larger infarct size, and more complications, and is 3.83 times more likely to have poor functional recovery (mRS 3–5) at 30 days compared with normoglycemics(21). Elevated serum creatinine (>1.2 mg/dL) has also been linked with higher mortality and worse outcomes in both cardiovascular and cerebrovascular events. A study in Eastern Ethiopia demonstrated that patients with elevated creatinine had a ~54% higher risk of in-hospital mortality compared to those with normal levels (26). Another study in Yekatit 12 Hospital showed that mortality was higher among patients with renal dysfunction (35.3%) versus those without (15.2%)(22).

Comorbidities: Pre-existing medical conditions significantly impact stroke outcomes. Uncontrolled hypertension is not only a primary risk factor but also contributes to worse outcomes. Diabetes mellitus is associated with a higher risk of recurrent stroke and poorer functional recovery. Atrial fibrillation is a major cause of cardioembolic stroke, which is often severe, and is associated with high rates of mortality and disability (4,23).

In-hospital Complications: The development of medical complications during hospitalization is a major driver of poor outcomes. These include aspiration pneumonia (often secondary to dysphagia), urinary tract infections, deep vein thrombosis and pulmonary

embolism, and fever. These complications can delay rehabilitation and increase mortality(14,23).

Health System Determinants:

Delayed Hospital Presentation: Time is a critical factor in acute stroke care. Delays between symptom onset and hospital arrival are a pervasive problem in LMICs, including Ethiopia, effectively excluding the majority of patients from time-sensitive therapies like intravenous thrombolysis or endovascular thrombectomy (14,24). Factors contributing to delay include poor public awareness of stroke symptoms, geographical barriers, and a lack of organized emergency medical transport systems (24). The national meta-analysis confirmed that delayed hospital arrival (>24 hours after onset) was significantly associated with poor outcomes, with a pooled AOR of 4.67(8,18).

Access to Neuroimaging: Rapid neuroimaging with either a non-contrast computed tomography (CT) scan or a magnetic resonance imaging (MRI) scan of the brain is essential in the acute setting. Its primary role is to reliably distinguish between ischemic and hemorrhagic stroke, a distinction that is fundamental to all subsequent treatment decisions. Lack of 24/7 availability of CT or MRI services can lead to diagnostic uncertainty and delays in appropriate management (23,25).

Stroke Unit Care: Management in a dedicated multidisciplinary stroke unit, an organized, inpatient setting that provides coordinated care from physicians, nurses, and rehabilitation therapists with expertise in stroke is considered the single most important intervention for improving patient outcomes. Meta-analyses have shown that stroke unit care reduces death, disability, and the need for long-term institutionalization, irrespective of patient age, sex, or stroke severity(26,27).

2.3 Gaps in the Literature

Despite the growing body of research on stroke in Ethiopia, a significant evidence gap persists for healthcare facilities outside of the major cities. The majority of published studies are from large, well-resourced referral hospitals in Addis Ababa. It remains unclear whether the patterns of stroke subtypes, risk factors, determinants of outcome, and magnitudes of

mortality and disability are consistent in semi-urban and rural-serving hospitals like WKUSH.

Other studies done in different parts of the country reveal significant geographical and regional discrepancies, posing a considerable challenge to the generalizability of findings

Factors such as patient awareness of risk factors, health literacy regarding stroke symptoms, reliance on traditional medicine, transportation infrastructure, and the capacity of primary care systems to manage chronic NCDs may differ substantially between these environments.

2.4 Conceptual framework

The conceptual framework is designed based on the review of the literature and the objectives of the study during proposal development and later revised after internal validation.

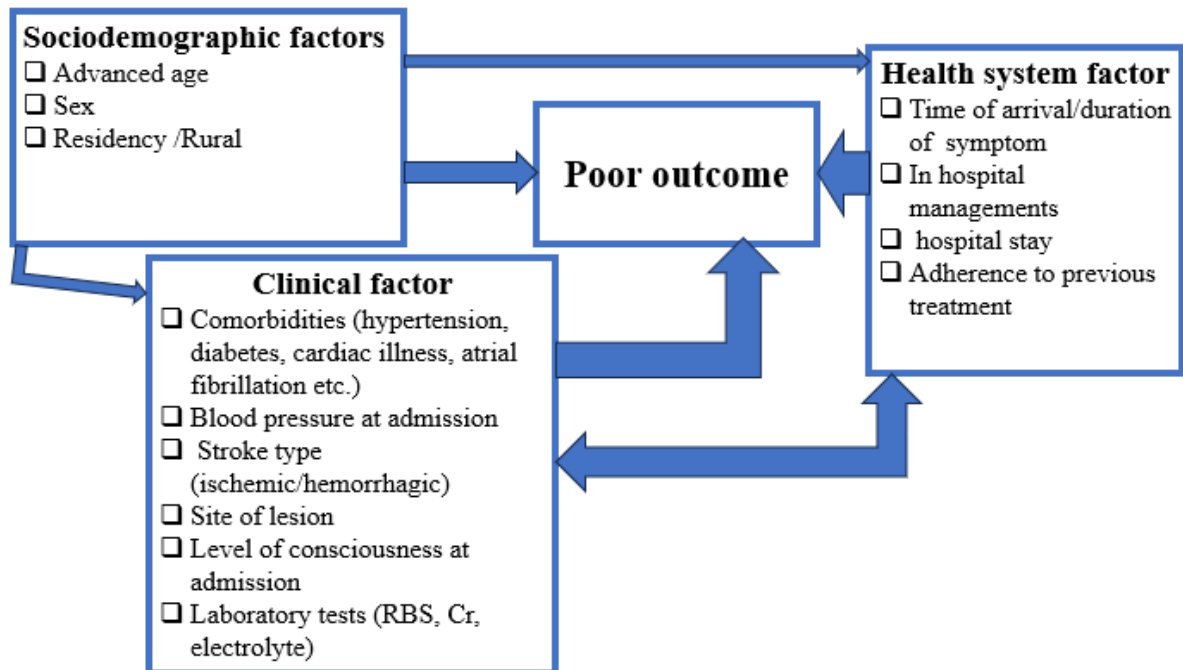


Figure 1: Conceptual framework for In-hospital outcome and associated factors among adult acute Stroke Patients Admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

3. OBJECTIVES OF THE STUDY

3.1 General Objective

To assess outcomes of acute stroke and associated factors among adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025.

3.2 Specific Objectives

1. To determine the proportion of poor outcomes among adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025.
2. To identify associated factors of poor outcomes among adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025.

4. MATERIALS AND METHODS

4.1 Study Area and Period

The study was conducted at Wolkite University Specialized Hospital (WKUSH), a tertiary teaching and referral institution situated in the Gurage Zone of the Central Ethiopia Region and located in the Gubre sub-city, 172 kilometers southwest of Addis Ababa and 10 kilometers south of Wolkite town. Since its establishment in July 2019, WKUSH has served as the primary referral center for the Gurage Zone and its surrounding regions, catering to a catchment population of approximately four million people. Affiliated with the College of Health Sciences at Wolkite University, the hospital has a total inpatient capacity of 300 beds. These are distributed across its major medical, surgical, gynecology and obstetrics, and pediatric wards, as well as specialized units for orthopedics, psychiatry, intensive care unit, and ophthalmology. The medical ward has 32 beds separated for males and females. But the hospital has no dedicated Stroke unit. To date, the hospital has provided care to over 327,000 individuals and maintains an annual patient volume of approximately 70,000.

For this study, a two-year retrospective chart review was conducted on patients admitted to the medical ward with a diagnosis of acute stroke. Data was collected from December 1-30, 2025.

4.2 Study Design

A facility-based retrospective cross-sectional study

4.3 Population

4.3.1. Source population

Patients admitted to WKUSH medical ward with a diagnosis of acute stroke

4.3.2. Study populations

The study population consisted of all adult patients (≥ 18 years) admitted to WKUSH during the study period with a primary diagnosis of acute stroke.

4.4 Eligibility Criteria

4.4.1. Inclusion Criteria

All patients aged 18 years and above with a confirmed diagnosis of acute stroke and having a medical record with a definitive outcome.

4.4.2. Exclusion Criteria

Patients with incomplete medical records (missing key information on diagnosis, outcome, or major clinical variables and those who missed the enrollment period), patient with only a clinical diagnosis (has no imaging), patients with Transient Ischemic Attack (TIA)

4.5 Sample Size and Sampling Technique

4.5.1 Sample size determination

The required sample size was determined using the single population proportion formula for the first objective, assuming a proportion of patients with poor in-hospital outcomes 30.18%.(8) This figure is ideal because it is a pooled estimate from multiple studies across Ethiopia, making it a more reliable and generalizable. Using a 0.05 margin of error, 95% confidence level, and adding 10% for incomplete data. But according to the hospital inpatient data registry, there are about 282 stroke patients over the last 02 years.

Using the formula for sample size calculation for cross-sectional studies

- Estimated proportion $p=0.32$ (i.e., 30.18%)
- Confidence level = 95% $\rightarrow Z=1.96$
- Margin of error $d=0.05$
- Population size $N=282$
- Contingency (non-response adjustment): 10%

Step 1: Initial Sample Size (without correction)

$$n = \frac{z^2 x_p (1 - p)}{d^2}$$

$$n = \frac{1.96^2 x_{0.3} (1 - 0.3)}{0.05^2} = 322.69 \sim 323$$

Step 2: Finite Population Correction (FPC)

$$nf = \frac{n}{1 + \frac{n-1}{N}}$$

$$\text{Therefore } nf = \frac{323}{1 + \frac{323-1}{282}} = 150.7$$

Step 3: Add 10% Contingency $150.7 + 15.1 = 165.8 \approx 166$

Final Sample Size = 166

The sample size for the determination of associated factors for poor outcome was calculated by using two population proportion formula, taking different factors with assumptions of 5% precision and 95% confidence level. Sample size for this objective was calculated using EPI Info version 7 as the following table.

Table 1: Sample size determination by using two population proportion formulas from significantly associated factors with poor outcomes.

Factors	Prevalence of the Unexposed group (p2)	Power	AOR	Final Sample (+10%)	Ref.
Stroke type (Hemorrhagic)	39.3%	80%	2.68	185	(28)
Delay (>24h)	35.5%	80%	2.92	152	(28)
GCS (<=8)	36.2%	0.84	7.26	40	(19)
Comorbidities (Yes vs. No)	22.2%	80%	5.25	65	(29)
Age (>65 vs 25-44)	51.4%	80%	2.56 [156	(29)

Although the largest calculated sample size was 185, all 282 patients were included because the source population during the study period was manageable, and doing so will provide us with better power and generalizability for our analysis.

4.5.2 Sampling technique

Census of all eligible patients in the study period

4.6 Variables

4.6.1 Dependent variable

Poor outcome

4.6.2 Independent variable

- Socio-demographic: Age, sex, place of residency,

- Health system related: time of arrival, in hospital managements (medications, hospital stay, and medical therapy)
- Clinical: Comorbidities (hypertension, diabetes, cardiac illness, atrial fibrillation etc.), stroke type (ischemic/hemorrhagic), GCS at admission, laboratory tests (RBS, Cr, electrolyte), and blood pressure at admission, and medical complications.

4.7 Operational Definitions

Acute Stroke: A sudden onset of focal or global neurological deficit persisting for more than 24 hours, or leading to death, with evidence of cerebral infarction or hemorrhage confirmed by brain imaging (CT or MRI)(30). For this study, symptom onset should be less than one week with supportive imaging findings.

Delayed Arrival: Defined as hospital arrival more than 4.5 hours after symptom onset (for thrombolysis-related analysis) or more than 24 hours (for overall delay analysis). Derived from symptom onset or last seen normal and arrival timestamps(31).

Comorbidity: Presence of one or more chronic conditions such as previous stroke, ischemic heart disease, chronic kidney disease, or COPD, recorded in the medical chart(32).

In-Hospital Complications: Any of the following conditions developing during hospitalization: aspiration pneumonia, urinary tract infection, deep vein thrombosis, pressure ulcer, or seizure, based on the clinician's diagnosis and documentation in the patient record(33).

Length of Hospital Stay: Total number of calendar days from date of admission to date of discharge or death based on hospital admission and discharge logs(34).

Uncontrolled blood pressure: Documented need for short-acting or intravenous antihypertensive after hospitalization.

Poor treatment outcome: Patient developed any medical complications or died, or referred to higher facility(28).

4.8 Data Collection

4.8.1 Data Collection Tool

A pre-tested, structured data extraction checklist was used to collect data from patient medical records. The questionnaire was developed through reviewing various relevant literature, and it was prepared in English. The checklist had sociodemographic, clinical characteristics, and treatment outcome categories with contain all important dependent and independent variables

4.8.2 Data collection procedures

Data was collected by three trained health professionals capable of understanding and interpreting each component of the patient's chart.

4.9 Data Quality Control

A well-organized Google Form was used as the primary data collection tool, incorporating built-in validation rules and required fields to enhance data accuracy and completeness from the outset. I recruited BSc nurses and a resident as data collectors and provided them with focused training on the research protocol and proper data entry procedures to maintain consistency in data collection. In addition, I conducted daily supervision and data checks to identify and correct any errors or inconsistencies promptly, thereby ensuring the overall integrity and validity of the dataset.

4.10 Data Analysis

Data was entered into Epi-Data version 4.7.0 and exported to SPSS version 27.0 for statistical analysis. Descriptive statistics were used to summarize the study population. Categorical variables are presented as frequencies and percentages, and continuous variables are reported as means \pm standard deviation or medians with interquartile ranges. Bivariate and multivariate analyses were employed to assess associations. Variables with a p-value $<$ 0.25 were included in a multivariable logistic regression model to identify independent predictors of poor treatment outcomes. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated, and p-values $<$ 0.05 were considered statistically significant.

4.11 Ethical Considerations

Ethical clearance was obtained from the ethical committee of Wolkite University. A formal letter of permission was secured from the WKUSH administration. To ensure confidentiality, patient identifiers were not collected.

4.12 Dissemination of Results

The findings will be submitted to the Wolkite University College of Medicine and Health Sciences and presented to WKUSH clinical staff and other concerned bodies. The manuscript will be submitted for publication in a peer-reviewed journal

5. RESULT

5.1 Socio-demographic characteristics

A total of 236 patients with acute stroke were included in the study. There was a slight male dominance, accounting for 122 (51.7%) of cases. The minimum and maximum ages of the study participants were 23 and 102 years old, respectively, with a mean of 62.07 (\pm 13.65). A large majority (89.0%), were residents of rural areas (Table-2)

Table 2: Sociodemographic characteristics of adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

	Category	Frequency	Percent
Age	18-45	30	12.7
	45-65	114	48.3
	>65	92	39
Sex	Male	122	51.7
	Female	114	48.3
Place of Residency	Rural	210	89
	Urban	26	11

5.2 Clinical factors

Hypertension was the most prevalent risk factor identified in 160 patients (67.8%). Cardiac-related comorbidities were present in 27(11.4%) patients, atrial fibrillation in 14(5.9%), diabetes mellitus was documented in 7(3%) of patients, and 10(4.2%) had a prior history of stroke or transient Ischemic attack (TIA).

Nearly all patients (99.6%) presented with unilateral body weakness. Failure to communicate was observed in 69(29.2%) patients, while severe headache was reported in 10 (4.2%).

The admission systolic blood pressure of 184(78.0%) patients was 140 and above, whereas 197(83.5%) having DBP 80 and above, with mean systolic and diastolic blood pressures were 165.7 \pm 31.5 mmHg and 96.5 \pm 17.5 mmHg, respectively (Table-3).

Neurological status was consistently assessed with the Glasgow Coma Scale (GCS). Accordingly, 154(65.3%) patients had a GCS of 13 to 15, while 82 (34.7) had scores 3-12. Other severity and prognostic scoring tools like NIHSS and ICH score are documented very rarely; furthermore, mRS was never used (Table-4).

Laboratory evaluation demonstrated metabolic and electrolyte disturbances during the acute phase. The mean random blood sugar at presentation was 140.0 ± 32.6 mg/dL. The mean serum creatinine level was 1.06 ± 0.70 mg/dL, with more than 25% of patients having creatinine of more than 1.2 mg/dL. Severe hyponatremia was observed in 9% of patients. Potassium and chloride had no significant variation or abnormalities, though about 47 patients had missed sodium and potassium, 7 patients had no evidence of serum creatinine determination, large majority of patients had no serum chloride.

Table 3: Clinical characteristics related to comorbidities of adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

		N	%
Hypertension	No	76	32.2%
	Yes	160	67.8%
Prior Stroke or TIA	No	226	95.8%
	Yes	10	4.2%
Cardiac Illness	No	209	88.6%
	Yes	27	11.4%
Diabetes Mellitus	Yes	7	3.0%
	No	229	97.0%
Atrial Fibrillation	No	222	94.1%
	Yes	14	5.9%
Other Comorbidities	No	228	96.6%
	Yes	8	3.4%

Table 4: Clinical characteristics related to presenting illness of adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

		N	%
One-sided body weakness	No	1	0.4%
	Yes	235	99.6%
Failure to communicate	No	167	70.8%
	Yes	69	29.2%
Stroke Type	Hemorrhagic Stroke	96	40.7%
	Ischemic Stroke	140	59.3%
Systolic blood pressure	<140	52	22.0%
	>=140	184	78.0%
Diastolic blood pressure	<80	39	16.5%
	>=80	197	83.5%
GCS at admission	3-12	82	34.7%
	13-15	154	65.3%
Random Blood Sugar(N=204)	<140	105	52.0%
	>=140	99	48.0%
	>=140	99	48.5%
Serum Creatinine(N=229)	<1.20	170	74.2%
	<=1.20	59	25.8%
Serum Sodium(N=189)	<125	17	9.0%
	125-130	18	9.5%
	130-155	43	22.8%
	135-145	111	58.7%

Imaging findings revealed that ischemic stroke was more common than hemorrhagic stroke, 59.3% versus 40.7%. The most frequently involved sites were the basal ganglia 31.4% and the middle cerebral artery territory 29.7%. Some proportion of patients (9.7%) had unremarkable initial NCT (Figure-2)

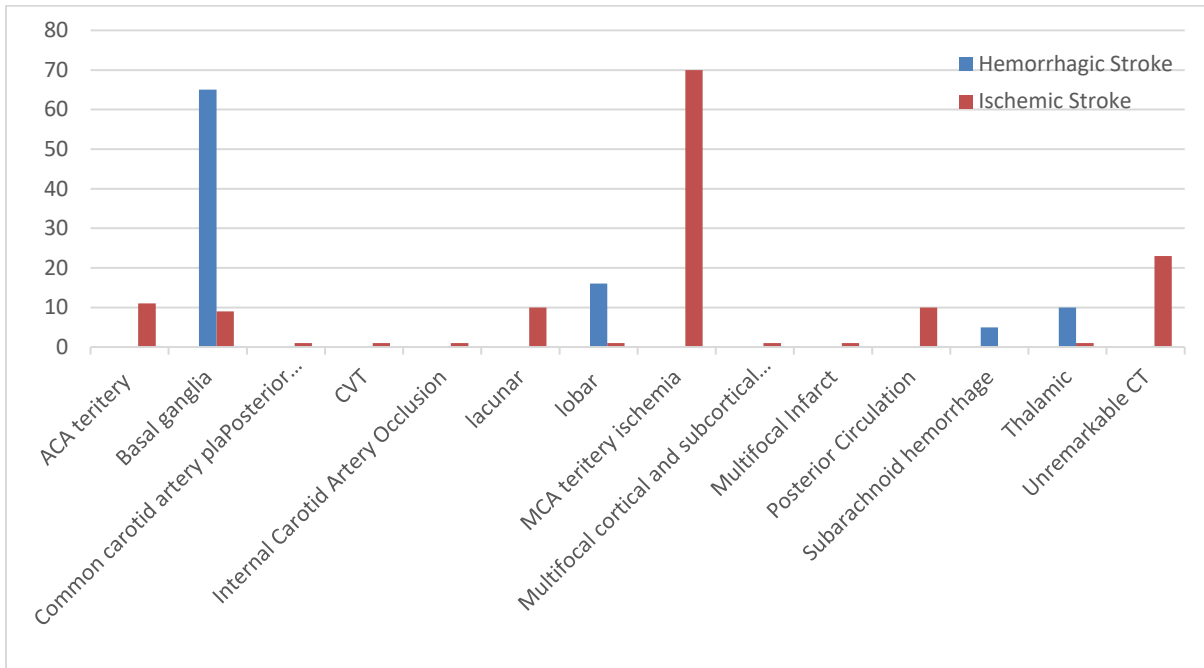


Figure 2: Imaging results of adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

5.3 Health system-related actors:

Most patients presented to the hospital several hours to days after symptom onset. The median time of arrival from symptom onset was 14 (IQR 7-24) hours (Figure-3). Only 12.7% presenting within 4 hours.

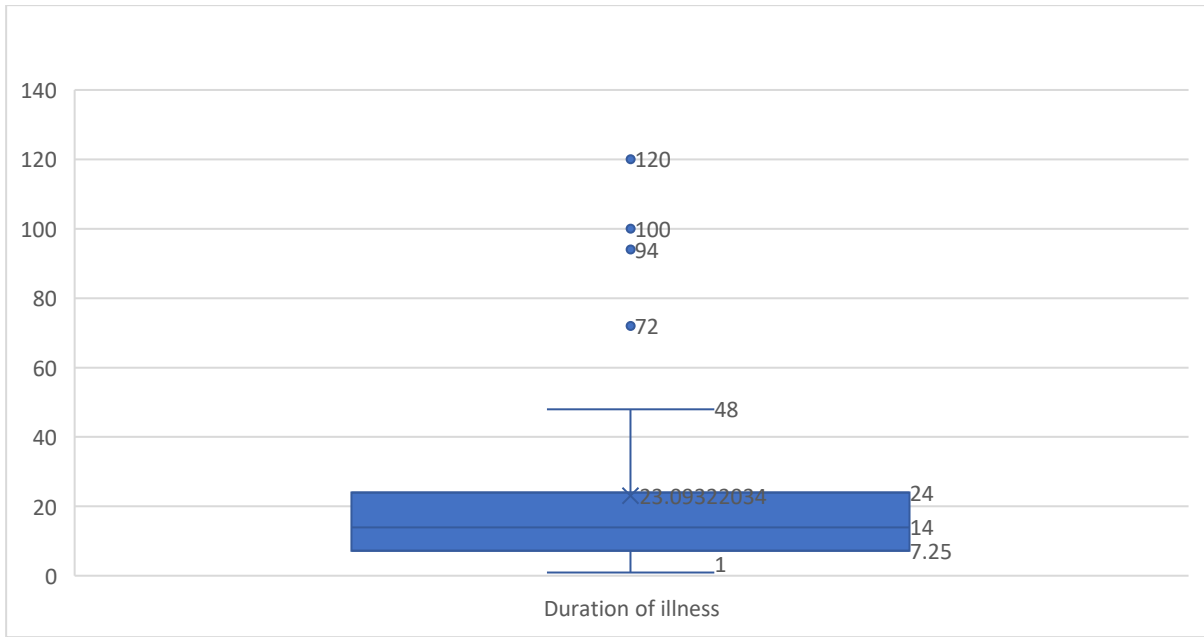


Figure 3: Box and Whiskers plot showing the distribution of duration of illness among adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

Of the study participants, 200 (84%) had one or more of the co-morbidities (mentioned in Table 3), and among them, 159(67.4%) were not adherent to their prior treatments according to the physician's documentation

During hospitalization, patients received pharmacologic management tailored to stroke type, blood pressure status, and associated comorbidities. Angiotensin-converting enzyme inhibitors (ACEIs) were the most commonly prescribed agents, administered to 171 (72.5%) patients, followed by calcium channel blockers (CCBs) in 100 (42.4%) patients. For acute blood pressure control, short-acting antihypertensive agents were used in 39 (16.5%) patients. Additional medications, including thiazide diuretics and spironolactone, were prescribed in selected cases. Only a small proportion of patients did not receive antihypertensive therapy, and blood pressure was controlled for the majority (69%) within 24 hours (table-5).

Aspirin was ordered for 136 (57.6%) patients, and statins for 130 (55.1%). Clopidogrel and heparin were used in selected patients based on clinical indications. Gastrointestinal prophylaxis with proton pump inhibitors or H2 blockers was provided to 78 (33.1%) patients. Other medications, including anticoagulants, osmotic agents, antiepileptics, and antibiotics,

were used infrequently, whereas none of the patients took IV thrombolytics or underwent thrombectomy (Table-5)

Table 5: Pharmacological treatment of adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

		N	(%)
Antihypertensive	ACE inhibitors (ACEI)	171	72.5%
	Calcium channel blockers (CCB)	100	42.4%
	Short-acting antihypertensives	39	16.5%
	Thiazide diuretics	25	10.6%
	Spirolactone	2	0.8%
	Acetazolamide	2	0.8%
Antiplatelets	Aspirin	136	57.6%
	Clopidogrel	11	4.7%
Lipid-lowering Agents	Statins	130	55.1%
GI prophylaxis/treatment	PPI / H2 blocker	78	33.1%
Anticoagulants	Heparin	31	13.1%
	Other	27	11.4%
BP Control time	< 24-hour	163	69.1%
	24-48 hours	36	15.3%
	>=48 hours	37	15.7%

With respect to hospital stay, most patients were admitted for a relatively short duration (Figure-4). The median duration of hospital stay in days is 5 (IQR 3-7).

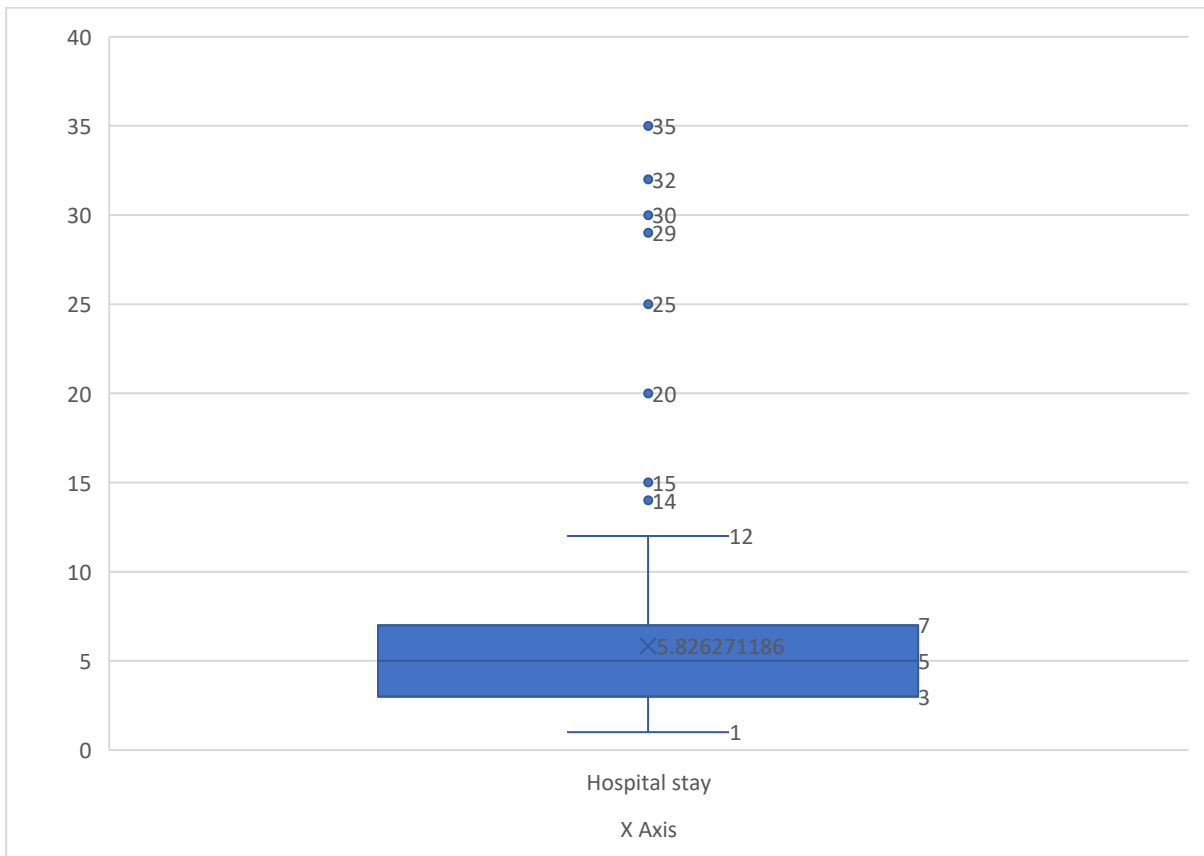


Figure 4: Box and Whiskers plot showing the distribution of length of hospital stay among adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

5.4 In-hospital outcome

Regarding outcomes, 139(58.9%) patients are discharged with a favorable outcome, while 97(41.1%; 95C% CI:37.7-47.6) had a poor outcome. Among those with poor outcomes, 66(28.0%) deteriorated clinically due to an in-hospital medical complication, and 29(12.3%) died.

Aspiration pneumonia was the most frequent complication, affecting 51 (21.6%) patients, followed by increased intracranial pressure in 28 (11.9%). Severe hyponatremia and AKI were observed in 17(8.9%) and 15(6.3%) of patients, respectively. Bedsores, seizures, gastrointestinal bleeding, deep vein thrombosis, hemorrhagic transformation, UTI, and others are also among the recorded complications (Table-6)

Table 6: In-hospital outcomes and complications of adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

Outcome Status	Improved	139	58.9
	Deceased	29	12.3
	Deteriorated	66	28
	Referred	2	0.8
Complications	Aspiration pneumonia	51	21.6
	Increased ICP	28	11.9
	Severe hyponatremia	17	8.9
	AKI	15	6.3
	Seizure	10	4.2
	Urinary tract infection	8	3.4
	Pressure Ulcer	6	2.5
	Other Complications	10	4.2

5.5 Associated factors of poor outcome

In the initial bivariate logistic regression analysis, several variables showed an association with poor stroke outcomes at a significance level of $p < 0.25$ and were considered candidates for multivariable analysis. These included neurological status at admission (GCS), elevated random blood sugar (≥ 140 mg/dL), increased serum creatinine (≥ 1.2 mg/dL), prolonged length of hospital stays (>7 days), delayed blood pressure control, failure to communicate, hemorrhagic stroke type, hypertension, and prior history of stroke or transient ischemic attack. The rest of the variables, like age, sex, place of residency, duration of illness before arrival, site of lesion on imaging, serum potassium, and chloride, comorbidities other than hypertension, and prior stroke/TIA etc are failed to show association.

In the multivariable logistic regression model, several factors remained independently associated with poor stroke outcomes after adjusting for potential confounders. Neurological status at admission was a strong predictor of outcome. Patients presenting with a Glasgow

Coma Scale (GCS) score of 3–12 had nearly seven times higher odds of poor outcome compared with those with GCS 13–15 (AOR = 6.98; 95% CI: 3.14–15.53; $p < 0.001$).

Metabolic and renal parameters also showed significant associations. Patients with elevated random blood sugar (≥ 140 mg/dL) had more than twice the odds of poor outcome compared to those with normal blood glucose levels (AOR = 2.26; 95% CI: 1.07–4.76; $p = 0.032$).

Similarly, elevated serum creatinine (≥ 1.2 mg/dL) was independently associated with poor outcome, with nearly threefold higher odds compared to patients with normal renal function (AOR = 2.87; 95% CI: 1.22–6.74; $p = 0.016$).

Patients who stayed in the hospital for more than seven days had a higher likelihood of poor outcome compared with those admitted for one to seven days (AOR = 3.12; 95% CI: 1.34–7.27; $p = 0.008$). In addition, delayed blood pressure control within 24–48 hours was associated with nearly three-fold increased odds of poor outcome compared with blood pressure control within the first 24 hours (AOR = 2.89; 95% CI: 1.04–8.01; $p = 0.041$). However, blood pressure control after 48 hours did not remain statistically significant after adjustment (AOR = 1.64; 95% CI: 0.56–4.79; $p = 0.365$) (Table 7).

Table 7: Multivariate logistic regression analysis of associated factors of poor outcomes in adult acute stroke patients admitted to Wolkite University Specialized Hospital, Central Ethiopia, from October 2023 to December 2025

Variable	Category	Poor Outcome		COR	p-value	AOR	p-value
		Yes	No				
Diastolic BP	≥80	74	98	1.44(0.79– 2.62)	0.230	0.71 (0.31–1.65)	0.430
	<80	22	42	1	1	1	1
GCS at admission	3–12	68	24	11.74(6.30– 21.86)	<.001	6.98 (3.14–15.53)	< 0.001
	13–15	28	116	1	1	1	1
Random Blood Sugar	≥140	49	50	2.14 (1.21– 3.78)	0.009	2.26 (1.07–4.76)	0.032
	<140	33	72	1	1	1	1
Serum Creatinine	≥1.20	35	24	2.67(1.46– 4.91)	0.002	2.87 (1.22–6.74)	0.016
	<1.20	60	110	1	1	1	1
Length of hospital stay	>7	37	17	4.54(2.36 – 8.72)	<.001	3.12 (1.34–7.27)	0.008
	1–7	59	123	1	1	1	1
BP control rate in hours	24–48	22	14	3.45(1.63– 7.28)	0.001	2.89 (1.04–8.01)	0.041
	≥48	23	14	3.61 (1.71– 7.58)	<.001	1.64 (0.56–4.79)	0.365
	<24	51	112	1	1	1	1
Failure to communicate	Yes	46	23	4.68(2.57– 8.53)	<.001	2.01 (0.89–4.52)	0.092
	No	50	117			1	1
Stroke Type	Hemorrhagic	47	49	1.78(1.05– 3.03)	0.033	1.38 (0.60–3.16)	0.446
	Ischemic	49	91	1	1	1	1
Hypertension	Yes	71	89	1.63(0.92– 2.88)	0.095	1.13 (0.47–2.69)	0.791
	No	25	51	1	1	1	1
Prior Stroke or TIA	Yes	6	4	2.27(0.62 – 8.26)	0.215	2.32 (0.37–14.64)	0.370
	No	90	136	1	1	1	1

6. DISCUSSION

This study evaluated poor outcomes and associated factors among adult patients admitted with acute stroke at Wolkite University Specialized Hospital medical ward from October 2023 to December 2025. Overall, 41.1% of patients experienced a poor outcome, including 28.8% clinical deterioration and 12.3% in-hospital death. Multivariable logistic regression analysis identified admission neurological status, hyperglycemia, renal dysfunction, delayed blood pressure control, and prolonged hospital stay as independent predictors of poor outcome. These findings highlight the dominant role of early stroke severity, metabolic disturbances, and quality of inpatient care in determining outcomes.

The mean age of patients in this study was 62.1 years, with nearly 87% aged above 45 years, a pattern comparable to reports from Jimma, Addis Ababa, Ambo, and Nekemte hospitals, where mean ages ranged from 58 to 64 years(6,7,10,35). Stroke predominantly affected older adults, reflecting cumulative exposure to vascular risk factors and age-related cerebrovascular changes. Although males constituted 51.7% of cases, sex was not an independent predictor of outcome after adjustment, consistent with Ethiopian studies reporting comparable outcomes between males and females once stroke severity is considered(19,35).

In this study, the median time from symptom onset to hospital presentation was 14 hours, with only 12.7% of patients arriving within four hours. This is comparable to findings from Jimma Medical Center, where fewer than 15% of patients presented within the first 4.5 hours, and Tikur Anbessa Specialized Hospital, where delayed presentation beyond 6 hours was reported in over 70% of cases(10,11,35). Delayed presentation increases the risk of early neurological deterioration and limits opportunities for timely physiological stabilization, contributing to unfavorable outcomes.

Admission neurological status was the strongest predictor of outcome in this study. Overall, 34.8% of patients presented with moderate to severe impairment of consciousness (GCS ≤ 12). Among these patients, 71.7% experienced poor outcomes, compared with only 19.4% among patients presenting with GCS 13–15. Similar patterns have been reported in Addis Ababa and Jimma, where poor outcomes occurred in 65–75% of patients with GCS ≤ 12 versus 15–25% among those with mild impairment(10,35,36).

After adjustment, patients with GCS 3–12 had nearly seven-fold higher odds of poor outcome, confirming admission GCS as the most powerful independent predictor. Low GCS reflects extensive brain injury, raised intracranial pressure, and involvement of critical neural structures, particularly in large territorial infarctions and intracerebral hemorrhage(16,17). GCS remains a simple yet invaluable tool for early risk stratification and prioritization of care.

Failure to communicate showed a twofold increased odds of poor outcome (AOR = 2.01, 95% CI: 0.89–4.52), although this did not reach statistical significance ($p = 0.092$). Clinically, this finding remains relevant. Communication impairment in acute stroke may arise either from aphasia due to dominant hemispheric cortical involvement or from a depressed level of consciousness reflecting global neurological compromise. These two conditions do not carry equal prognostic weight; reduced consciousness is typically associated with more severe brain injury and poorer outcomes, whereas isolated aphasia with preserved mentation may have a more variable prognosis. In this study, failure to communicate may have overlapped with low GCS, which was already a strong independent predictor, potentially attenuating its independent effect

Admission hyperglycemia (RBS ≥ 140 mg/dL) was observed in approximately 42% of patients. Among these, 49.5% experienced poor outcomes, compared with 31.4% among normoglycemic patients. This finding is consistent with evidence from Tikur Anbessa Specialized Hospital, where poor outcomes were reported in 52–58% of hyperglycemic stroke patients versus 28–35% among those with normal glucose levels(21).

After adjusting for other variables, hyperglycemia remained an independent predictor of poor outcome, suggesting an effect beyond stroke severity alone. Stress-induced hyperglycemia exacerbates cerebral ischemia through oxidative stress, endothelial dysfunction, disruption of the blood–brain barrier, and lactic acidosis, leading to larger infarct size and impaired recovery(16,37). These findings emphasize the need for routine glucose monitoring and early metabolic control in acute stroke care, even among non-diabetic patients.

Elevated serum creatinine (≥ 1.2 mg/dL) was present in 25.0% of patients, among whom 59.3% experienced poor outcomes, compared with 35.3% among patients with normal renal

function. Similar proportions have been reported in Ethiopian tertiary hospitals, where poor outcomes ranged from 55–65% among stroke patients with renal dysfunction(22).

After adjustment, renal dysfunction remained independently associated with poor outcome. Renal impairment may worsen stroke prognosis through fluid and electrolyte imbalance, accumulation of uremic toxins, systemic inflammation, and reduced clearance of medications used in acute stroke management(16). Limited renal support services in resource-constrained settings may further amplify these risks.

Delayed blood pressure control within 24–48 hours was observed in approximately 15.3% of patients. Among these patients, 61.1% experienced poor outcomes, compared with 31.3% among those whose blood pressure was controlled within the first 24 hours. Similar findings have been reported from Tikur Anbessa and Jimma Medical Center, where delayed early stabilization was associated with higher mortality and neurological deterioration(10,11,35).

Although patients with blood pressure control after 48 hours had higher crude rates of poor outcome (62–65%), this association did not remain statistically significant after adjustment. This suggests that early, rather than late, hemodynamic control is critical. International guidelines emphasize timely blood pressure management to prevent secondary brain injury in both ischemic and hemorrhagic stroke(14,17).

In this study, 22.9% of patients stayed in the hospital for more than seven days. Among these patients, 68.5% experienced poor outcomes, compared with 32.4% among those admitted for one to seven days. Comparable findings have been reported from Jimma and Hawassa hospitals, where poor outcomes occurred in 60–70% of patients with prolonged hospitalization(13,19,35).

Aspiration pneumonia was the most frequent complication, affecting 21.6% of patients. Ethiopian studies report aspiration pneumonia rates ranging from 18–30%, consistently identifying it as a major contributor to in-hospital mortality and deterioration(19,35). Prolonged hospitalization likely reflects severe neurological impairment, medical complications, and delayed recovery, serving as a marker of disease severity rather than a direct cause of poor outcome.

The in-hospital death in this study was 12.3%, which is lower than rates reported from Jimma Medical Center (18–22%), Hiwot Fana Comprehensive Specialized Hospital (15–19%), and Tikur Anbessa Specialized Hospital (17–20%)(19,26,35). However, it is higher than mortality reported from Ambo University Referral Hospital (8.6%) and Nekemte Referral Hospital (9–10%)(6,7).

These differences may be due to variations in stroke severity, timing of presentation, and burden of in-hospital complications. Importantly, multivariable analysis demonstrated that mortality and overall poor outcome were primarily driven by neurological severity, hyperglycemia, renal dysfunction, delayed blood pressure control, and prolonged hospitalization, rather than sociodemographic factors or stroke subtype alone.

Another important contextual finding was that none of the patients received reperfusion therapy (intravenous thrombolysis or mechanical thrombectomy), even among those who presented within the recommended therapeutic window, primarily due to limited infrastructure and absence of organized stroke services. Robust evidence indicates that reperfusion therapy significantly improves functional outcomes in acute ischemic stroke, and it has been a while since it became the standard of care in acute ischemic stroke.

7. STRENGTHS AND LIMITATIONS OF THE STUDY

7.1 Strengths

This study provides valuable context-specific evidence on stroke outcomes in a resource-limited setting where data remain scarce. The relatively large sample size and inclusion of both ischemic and hemorrhagic stroke patients enhance the robustness and representativeness of the findings. Use of multivariable logistic regression allowed adjustment for important confounders and identification of independent predictors of poor outcome. The reliance on objective clinical, laboratory, and imaging variables such as Glasgow Coma Scale score, blood pressure, serum creatinine, and CT-confirmed stroke subtype strengthens the validity of the results. These clinical, laboratory, and imaging evidence permit meaningful comparison with national and international studies

7.2 Limitations

This study has several limitations. The hospital-based design may limit generalizability to the wider community, particularly patients who died before reaching the hospital. Variables relied on medical records, which were subject to incomplete documentation. Long-term functional outcomes after discharge were not assessed, restricting conclusions to in-hospital outcomes only.

8. CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

This study demonstrates that in-hospital outcomes among patients admitted with acute stroke at Wolkite University Specialized Hospital remain substantial, reflecting the continuing burden of acute cerebrovascular disease in resource-limited settings. The findings indicate that adverse outcomes are more strongly associated with markers of neurological severity and early physiological instability than with stroke subtype alone.

Reduced level of consciousness, hyperglycemia, impaired renal function, delayed blood pressure stabilization, and prolonged hospitalization appear to represent key elements along the pathway leading to mortality or severe disability. These factors likely reflect both the biological intensity of the initial brain injury and the complexity of the subsequent clinical course.

Overall, the study provides context-specific evidence on determinants of poor in-hospital stroke outcomes and deepens understanding of the clinical patterns observed in this setting.

8.2 Recommendations

For Clinicians

- Early and thorough neurological assessment using standardized tools such as the Glasgow Coma Scale, NIHSS, ICH, and mRS score should be routinely performed and clearly documented for future best practice.
- Prompt blood pressure monitoring and control within the first 24 hours of admission should be prioritized in acute stroke management.
- Renal function assessment should be integrated into the initial evaluation and ongoing management of stroke patients.
- Close monitoring and early management of complications are essential, particularly for patients with reduced consciousness and prolonged hospital stays.

For Hospital Administrators and Policymakers

- Strengthen acute stroke care protocols, including early triage and standardized management pathways.

- Improve availability of essential medications, monitoring equipment, and trained healthcare personnel.
- Establish and strengthen organized stroke unit care to enhance early management and reduce complications.

For Researchers

- Prospective, multicenter, and community-based studies are recommended to assess long-term functional outcomes and mortality after discharge.
- Future studies should explore the impact of structured stroke units and early blood pressure management strategies on patient outcomes.
- Research incorporating post-discharge follow-up is needed to understand long-term recovery and disability.

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10. Annex I Data Collection Tool

Assessment of In-Hospital Outcomes and Associated Factors in Acute Stroke Patients

This questionnaire is designed to gather data on treatment outcomes and associated factors in patients with acute stroke admitted to the Wolkite University Medical Ward.

*Indicates a required question

Part 1: Sociodemographic characteristics

1. ID * (Text input)
2. Age (years) * (Text input)
3. Sex * (Mark only one oval)
 - Male
 - Female
4. Place of Residence: (Mark only one oval)
 - Urban
 - Rural

Part 2: Clinical Characteristics

10. Date of Admission * (Date input, e.g., January 7, 2019)
11. Presenting Symptoms (select all that apply): *
 - Sudden weakness/numbness on one side of the body
 - Sudden difficulty speaking or understanding speech
 - Sudden vision problems in one or both eyes
 - Sudden dizziness/loss of balance or coordination
 - Sudden severe headache
 - Other:
12. Blood Pressure at Admission (mmHg) * (Numeric input)
13. Glasgow Coma Scale (GCS) Score at Admission: * (Numeric input)

14. Random Blood Sugar (mg/dL) at Admission: (Numeric input)

15. Type of Stroke: * (Mark only one oval)

- Ischemic Stroke
- Hemorrhagic Stroke
- Undetermined/clinically Dx as ischemic

16. Site of lesion (hemorrhage/ischemia) (Mark only one oval)

- Basal ganglia
- Lobar (hemorrhage)
- MCA territory (ischemia)
- ACA territory (Ischemia)
- Posterior circulation
- Thalamic
- Lacunar
- Subarachnoid (hemorrhage)
- Other:

17. Presence of Co-morbidities (select all that apply): *

- Hypertension
- Diabetes Mellitus
- Atrial Fibrillation
- Previous Stroke/TIA
- Dyslipidemia
- Heart Disease (e.g., ischemic heart disease, CMP, heart failure)
- Autoimmune (SLE, APS, etc.)
- None

- Other:

18. Patient's adherence to medication before stroke: * (Mark only one oval)

- Good (taking all meds with prescribed dose)
- Poor (discontinued or inconsistent, or poorly identified which drug is which)
- Not applicable (no prior medication)

Important laboratory findings: If the patient has more than one record of the same test, document the most deranged one

28. Creatinine (Numeric input)

29. Sodium (Na) (Numeric input)

30. Potassium (K) (Numeric input)

31. Chlorine (Cl) (Numeric input)

Part 3: Health system-related factors

Based on order sheet, medication chart and follow-up chart

31. Time of Stroke Symptom Onset (in hours) * (Numeric input)

32. Antihypertensive Drugs continued or started on admission (Check all that apply)

- ACEi
- CCB
- Thiazide
- Short-acting antihypertensive (labetalol, captopril, hydralazine, etc.)
- None
- Other:

33. Other Drugs (Check all that apply)

- Aspirin
- Clopidogrel
- Statin
- Heparin

- Warfarin
- PPI/H2 blocker
- Other:

34. For how long was the blood pressure uncontrolled after admission in hours (Duration from admission to last dose of short-acting antihypertensive if needed)? (Numeric input)

35. Hospital stay in days _____

Part 4: In-hospital outcomes

36. Presence of Complications during Hospital Stay (select all that apply) *

- Pneumonia
- Urinary Tract Infection (UTI)
- Deep Vein Thrombosis (DVT)/Pulmonary Embolism (PE)
- Seizures
- Gastrointestinal bleeding
- Pressure ulcers
- Hemorrhagic transformation
- Increased ICP
- Other:
- None

37. Outcome Status at Discharge/Assessment:

- Improved (significant neurological recovery and/or functional improvement, mRS 0-2 if documented and no complication at discharge)
- Deteriorated (worsening neurological status or functional decline(mRC \geq 3 if documented or discharged with medical complication)
- Deceased#
- Referred to higher facility *

38. #Documented cause of death _____

39. *Reason for referral _____

11. Annex II: Information sheet and consent form

Participant information sheet and informed consent form for health facilities administrators

My name is _____. I am working as a data collector for the research being conducted to assess poor treatment outcome and associated factors among adult patients admitted to WKUSH by **Dr Seid Yesuf** who is a 3rd year internal medicine resident at Wolkite University College of Medicine and Health Science.

The study Topic: assessment treatment outcome and associated factors among adult patients admitted to WKUSH.

Purpose of the study: The main aim of this study is to write a thesis as a partial requirement for the fulfillment of a certificate of specialty in internal medicine for the principal investigator. Moreover, the result of the study was used as evidence and input for WKUSH and other governmental and non-governmental organizations working on NCDs.

Procedure and duration: The data collectors will collect the necessary information from patient files using structured data extraction tools to have pertinent data that is helpful for the study. The duration of data collection was 30 days.

Risk and discomfort: By participating in this research project, no risk comes to the patient or the institution.

Benefit: The research has no direct benefit to those who have participated in this project. But the indirect benefit of the research for the participant and all other clients in the program is great. As identifying areas of improvement and taking appropriate decisions helps to improve the service, increase access and overall effectiveness of the program and reduce the incidence of mortality among adult stroke patients

Confidentiality: The information acquired from the patient file was confidential. There was no information that will identify in particular. The findings of the study was general for the study community and will not reflect anything, particularly on individual persons. The data

extraction tools was coded to exclude showing names and other personal information. No reference was made in oral or written reports that could link participants to the study.

Rights to refusal or Withdrawal: NA

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