Treatment Outcomes and Associated Factors for Hospitalized Stroke Patients in Selected Health Care Facilities of Kakamega County, Kenya

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Abstract:

Stroke is a serious medical condition that can lead to long-term disability and death. The prevalence of stroke is increasing, and the burden of care is significant. This study aimed to assess treatment outcomes and associated factors for hospitalized stroke patients in selected health care facilities of Kakamega County, Kenya. A cross-sectional study was conducted in Kakamega County, Kenya. A total of 153 patients with stroke were recruited from level four and level five hospitals. Data was collected on demographic characteristics, clinical presentations, stroke management, and treatment outcomes. The majority of patients were male (72.5%) and the mean age was 57 years. Ischemic stroke was the most common type of stroke (73.2%). Aspirin and statins were the most commonly used treatments. However, only 10% of patients received thrombolytic therapy, which is a medication that can dissolve blood clots and improve outcomes for stroke patients. Older age (AOR = 1.034; 95% = 3.05 95% CI: 1.25–7.44), and aspiration pneumonia (AOR = 5.94; 95% CI: 2.46–14.32) were significantly associated with poor treatment outcomes. The study found that 40% of stroke patients had poor treatment outcomes, including death. Older age, history of heart failure, loss of consciousness diabetes, and aspiration pneumonia were associated with poor treatment outcomes. The study's findings suggest that the treatment of stroke patients in Kakamega County is sub-optimal. Availing of thrombolytic therapy, devising appropriate preventive measures of risk factors (hypertension), and decreasing preventable complication such as aspiration pneumonia could improve patient outcomes.

Keywords **— Stroke, ischemic, hospitalized, health care, Kakamega.**

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I.   INTRODUCTION

Stroke, or cerebrovascular accident, as per the World Health Organization, is a clinical emergency consisting of quickly developing focal disorder of cerebral function that lasts more than a day or that leads to death. The origin is usually vascular in nature while the clinical signs might be global in the case of coma.[1] Stroke falls into three major categories; haemorrhagic, ischemic, and subarachnoid. Ischemic results from blood vessel blockage, it is heterogeneous, and more than 100 pathologies are implicated.[2] Intracerebral haemorrhage stands out as the second most common form, caused by bursting of small arteries owing to hypertensive vasculopathy, coagulopathies,

cerebral amyloid angiopathy, and other vasculopathies.[3] Around 5% of the strokes occur due to spontaneous SAH among 85% of the patients who have ruptured aneurysm.[4]

Globally, stroke affects 17 million people annually, leading to death or disability in two-thirds of the cases. Drilled down statistics have ischemic representing 62% of the deaths, ICH responsible for 28%, and 10% to SAH.[5] With these statistics, stroke is the second leading reason for mortality globally.[6] It is also the third leading factor for disability. In high-income countries, stroke is the third most common cause of death, surpassed only by cancer and heart disease.[7] This burden is cited to be higher in low- and middle-income countries.[8] As such, stroke poses a significant burden in lower-income countries, including the African region.

In Africa, an epidemiological transition, with lifestyle and socio-demographic shifts presenting as the underlying causes, is being witnessed. The burden of stroke and other non-communicable diseases is swiftly rising.[9] Consequently, stroke, a cardinal resultant of cardiovascular risk factors, is rising in terms of its incidence. The prognosis of the condition is also portraying a worrying trend, as stroke patients present poor health outcomes.[10] For instance, inpatient stroke mortality by day 30 was reported at 19.3% in the Democratic Republic of Congo, 43.2% in Ghana, 33.3% in Tanzania, and 23.2% in Cameroon, the 6-month stroke mortality rate in South Africa was 23%.[11]

In Kenya, stroke is a neglected condition punctuated with paucity of research data and evidence regardless of the immense resources and urgent care that it attracts. In Kakamega County, Kenya, stroke cases have been increasing over the past years, with significant mortality and disability rates reported. Despite the availability of evidence-based guidelines for stroke management, the practice of stroke care remains unorganized and inconsistent across levels. Some authors note that stroke patients are simply managed in regular general wards.[12] Therefore, the need for comprehensive studies to assess stroke management strategies and their outcomes is evident.

II. METHODOLOGY

Research Design

A cross-sectional study design was used to examine the influence of health care providers factors, patient's factors, health system factors and pharmacological management strategies on the outcome of patients presenting with stroke at selected health care facilities of Kakamega County, Kenya.

Study Area

The study was conducted in level 4 and 5 hospitals of Kakamega County namely; Kakamega CGH, Butere county hospital, Malava county hospital and Lumakanda county hospital.

Target Population

The diagnosis of stroke was based on the World Health Organization's (WHO) definition of stroke as a rapidly developed symptom of focal or global impairment of brain functions lasting more than 24 hours (or leading to death) with no obvious causes other than vascular origin. All adult stroke patients over the age of 18 who had either a clinical diagnosis of stroke with neuro-imaging or a verified diagnosis of stroke with CT-scan were included under this classification.

Sample Technique

The study used a Cluster sampling technique to group the health facilities in their respective levels of health care. Kakamega County health facilities have been grouped into four cluster levels, namely Hospitals (level 5 and 4), Health centres (level 3), and Dispensaries (level 2). Purposive sampling technique to select the health facilities in level five and four facilities.

Sample Size Calculation

The sample size was calculated to be 153. This was calculated using the formula:

$$n = (z^2 pq)/\delta^2$$

where:

- n = Desired sample size
- z = Standard Normal Deviation which was equal to 1.96 corresponding to 95% confidence interval
- p = Prevalence of the issue under study, 50% $p = 0.5$

- q = 1-p
- δ = the error of margin, taken as 0.05.

Data Collection

Data was collected using a semi-structured questionnaire. The questionnaire was divided into five sections: demographic characteristics, key medical histories, clinical presentations, management, and in-hospital events. Two nurses who had received specialized training carried out the data collection.

Data Analysis

The data was analyzed using the statistical package for social science (SPSS) version 27. Descriptive statistics such as proportions, means, and standard deviations were used to describe the socio-demographic variables and clinical results between stroke subtypes. The chi-square test or Fisher's exact test were used to compare categorical variables, and the t-test was used to compare continuous variables. For multivariate analysis, variables with a p-value of less than 0.05 in the bivariate analysis were included in the logistic regression model.

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III.   RESULTS

Risk factors and socio-behavioral characteristics among stroke patients

Men were the dominant participant (71.5 %) out of 153stroke patients who took part in the study. The patients' average age was 56.3±12.7 years. One out of every five patients smoked, and more than half, 64 (57 %), were from rural areas. People who had haemorrhagic stroke were associated with drinking alcohol more that of ischemic stroke. When it came to co-morbid conditions, hypertension (40.8 %) was the most frequently detected risk factor among the stroke cases studied. Other common risk factors included atrial fibrillation in 34 (21.9%), diabetes mellitus in 33 (21.2%), and a history of heart failure in 30 % (19.3%) of those diagnosed. In Table 4.1, the co-morbid illnesses with the lowest prevalence rates were chronic renal

disease (4%), coronary heart disease (11%), and a history of stroke (9%).

Table: Risk factors and socio-behavioural characteristics among stroke patients among stroke patients admitted at selected health care facilities of Kakamega county, Kenya

Variables	Ischemic (n = 112)	Haemorrhagic (n =	Total (n = 153)	p-value
Age (in years) ‡	57.2±11.5	53.6±13.6	56.3±12.2	0.128
Sex (male), n (%)	79 (70.4)	30 (74.6)	110 (71.5)	0.607
Residence (rural)	64 (57.0)	21 (52.7)	86 (55.9)	0.681
Smoking, n (%)	17 (14.9)	10(25.8)	29 (18.6)	0.172
Alcohol, n (%)	15(11.4)	12 (29.7)	27 (17.3)	0.009†
Co-morbid conditions				
Hypertension, n (%)	41 (36.5)	21 (52.7)	65 (40.8)	0.072
Diabetes, n (%)	20 (17.8)	12 (30.7)	33 (21.2)	0.087
AF, n (%)	23 (20.4)	10(25.8)	34 (21.9)	0.406
Pervious stroke, n	7 (6.1)	2	9 (5.5)	0.615*
Heart failure, n	22 (18.6)	8 (20.9)	30(19.3)	0.734
CAD, n (%)	8 (2.0)	5	12	0.734
CKD, n (%)	6 (5.3)	6 (14.6)	14 (8.8)	0.110*

Note; Abbreviations: AF atrial fibrillation, CAD, coronary artery disease, CKD, chronic kidney disease

‡Expressed as mean and standard deviations (SD); *Fisher's exact test, †Statistically significant at p- value <0.05

Treatment regimen Among Stroke Patients

During hospitalization, the most commonly prescribed antiplatelet and lip-lowering medications were aspirin and atorvastatin, approximately 43 % of the patients in the study. A small number of patients with haemorrhagic stroke (n = 5) received antiplatelets in addition to the anticoagulants. Enalapril was the most frequently prescribed antihypertensive medication among stroke patients, with about

42 % receiving it. The second most commonly prescribed medication was hydrochlorothiazide, which was given to approximately 26% of stroke patients. Three-fifths of hospitalized stroke patients received antibiotics (ceftriaxone and metronidazole) for the management of stroke complications and comorbid conditions.

Table: Treatment regimen among stroke patients admitted at selected health care facilities of Kakamega county, Kenya

Antibiotics were used to treat aspiration pneumonia and other hospital-acquired infections, which accounted for 34.3 % of all

hospitalized stroke patients were given phenytoin, 23% were given anti-pain medication, and 21% were given diabetic medication. No stroke patient received tPA at the hospital because the drug was not available.

Medication		Ischemic (n = 113)	Haemorrhagic (n = 40)	Total (n = 153)
Aspirin and statins	Aspirin and Atrovastatin	61 (36.5)	6	66 (42.7)
	Aspirin and			15 (9.4)
	Lovastatin Aspirin	16(14.3)	0	9 (5.5)
	and Simvastatin	9 (7.9)	0	
Total		89 (79.6)	4	94 (59.8)
ACEIs	Enalapril	49 (43.6)	15 (38.0)	65 (42.1)
	Captopril	2	5	6
Beta-blockers	Metoprolol	16 (15.2)	6	23 (14.6)
	Atenolol	3	1	4
	Propranolol	1	0	3
Diuretics	Hydrochlorothiazid	27 (45.0)	12 (30.7)	40 (25.8)
	Furosemide	5	3	9 (4.2)
	Mannitol	14 (10.6)	10 (25.8)	23 (14.6)
	Spirinolactone	5	0	5
CCBs	Nefidipine	3	8	8
	Amilodipine	5	2	5
	Phenytoin	11 (9.7)	9(23.4)	21 (13.4)
	Phenobarbitone	3	5	9 (5.5)
	Warfarin	16 (11.5)	1	18 (11.4)
Miscillaneous	Antibiotics	31 (27.6)	21 (52.7)	53 (34.3)
	Antipains	7	15 (38.0)	34 (21.9)
	Antacids	12 (10.6)	9(23.4)	22 (14.0)
	Antidiabetes	24 (21.3)	8	33 (21.2)
	Antipsychotics	3	1	5
	Antidepressants	2	0	2

hospitalized stroke patients. Similarly, 13.4% of

1) Complications Among Stroke Patients

More than half of the stroke patients had hemiparesis or hemiplegia, which accounted for 83 (54.21%). Then, they had aphasia, which accounted for 62 (40.5%) and headache, which accounted for 60% (39%). Patients who suffered an ischemic stroke were more likely than those who suffered a hemorrhagic stroke to manifest hemiparesis (p = 0.008). Hemorrhagic stroke patients were more likely than non-hemorrhagic stroke patients to experience headaches (p = 0.010) and a lower degree of consciousness (p = 0.006).

In patients who had a stroke, aspiration pneumonia was a common complication that arose during their hospitalization. Aspiration pneumonia happens in approximately 30% of stroke patients. Brain edema (increased intracranial pressure) was the most common neurological complication, which happened in about 19% of the people who were checked out. Seizures were another neurological consequence that was noted while patients were in the hospital. Seizures occurred in 13% of stroke patients. The researchers found that aspiration pneumonia and brain edema were associated with hemorrhagic stroke when compared to ischemic stroke (p-value = 0.001 for aspiration pneumonia and 0.024 for brain edema, respectively). Other consequences, such as seizures, deep vein thrombosis, hospital-acquired infections, and heart failure, were found to have no significant connection with the different forms of stroke. The average length of stay in the hospital was 14 days and 10 days.

Table Complications among stroke patients admitted at selected health care facilities of Kakamega County, Kenya

Variables, n (%)	Ischemic (n = 112)	Hemorrhagic (n = 41)	Total (n = 153)	p-value
Clinical presentations				
Hemiparesis	67 (59.6)	14 (35.6)	82(53.2)	0.008
Headache	36 (32.0)	22 (55.1)	59(38.2)	0.010
Aphasia	39 (34.7)	17 (42.9)	57(36.9)	0.355
Loss of consciousness	23 (20.4)	17 (42.9)	41(26.5)	0.006
Urinary incontinence	26 (23.1)	09 (23.4)	36 (23.2)	0.832
Quadriplegia	23 (20.4)	10 (25.8)	24 (21.9)	0.481
Others *	28 (24.9)	13 (30.4)	42(27.1)	0.314
Complications, n (%)				
Aspiration pneumonia	27 (24.0)	17 (42.9)	45 (29.1)	0.024
Brain edema	8 (7.0)	19 (47.8)	28 (18.0)	<0.001
Seizure	15 (13.3)	5 (8.7)	19 (12.0)	0.593
HAI	6 (5.3)	4 (11.3)	11 (6.8)	0.306
DVT	8 (7.0)	5 (13.6)	14 (8.8)	0.231
Hospital stay (days)‡	12.6±9.5	13.8±11.2	13.0±10.0	0.525

Notes: ‡Expressed as mean and standard deviations (SD); *Vomiting, shortness of breath, blurred vision, ataxia/gait abnormality, seizure/convulsion, facial palsy, and dysphagia, memory loss, coma.
Abbreviations: DVT, deep vein thrombosis; HAI, hospital acquired infections.

Treatment Outcomes among stroke patients

Modified Rankin Score used as outcome variable

In order to assess patient outcomes, Modified Rankin Score was used with a scale running from 0 – 6, i.e. from perfect health without symptoms to death. Scores were as assigned as follows:

- 0 = No symptoms.

- 1 = No significant disability. Able to carry out all usual activities, despite some symptoms.
- 2 = Slight disability. Able to look after own affairs without assistance, but unable to carry out all previous activities.
- 3 = Moderate disability. Requires some help, but able to walk unassisted.
- 4 = Moderately severe disability. Unable to attend to own bodily needs without assistance, and unable to walk unassisted.
- 5 = Severe disability. Requires constant nursing care and attention, bedridden, incontinent.
- 6 = Dead

Moderate and moderately severe disability was scored as 3 while severe disability and death retained the same scores of 5 and 6 respectively. The mean Modified Rankin Score was calculated after adding all the scores and calculating mean score. The mean Modified Rankin Score was 1.93 ± 1.58 with a range of 0.0 – 7.0. A score of 0 – 2 was considered as good outcome while a score of > 2.0 was poor outcome.

The results showed that out of 153 stroke patients, approximately 117 (76.5 %) were able to be discharged alive from the hospital, whereas 36 (23.5 %) died while in the hospital. Twenty-five patients (21.4%) were released with a significant handicap compared to the group of patients who were alive when they were discharged. Overall, 61 of the patients had unsatisfactory treatment results, but 92 of them (60%) had significant improvement and no severe disabilities when they were released from the hospital after treatment.

On the basis of the results of bivariate logistic regression analysis, variables with a p-value less than 0.25 were regarded as candidates for multivariate logistic regression analysis. As a result, the final multivariate logistic regression included socio-demographic characteristics (age,

gender, and place of residence), smoking, alcohol consumption, key medical history (hypertension, diabetes, atrial fibrillation, heart failure, and stroke), stroke subtypes, and length of hospital stay. Having a history of heart failure, diabetes that caused a loss of consciousness, and aspiration pneumonia were all linked to poor treatment outcomes in a multivariable analysis. Being over the age of 65 was also linked to poor treatment outcomes.

Table: Predictors of Treatment Outcomes Among Stroke Patients admitted at selected facilities of Kakamega county, Kenya

Variables	Treatment Outcome		COR (95% CI)	p-value	AOR (95% CI)	p-value
	Good (92)	Poor (61)				
Age			1.037 (1.011–1.066)	0.006	1.034 (1.003	0.031*
Smoking	13	15	1.97 (0.885–4.43)	0.096	0.678 (0.24–	0.465
Hemorrhagic	17	22	2.48 (1.199–5.165	0.014	1.41(536–3.77)	0.479
Hypertension	26	36	3.70 (1.88–7.34)	<0.001	2.26(1.001–	0.050
Diabetes	14	18	2.31 (1.07–5.04)	0.033	2.22 (0.87–5.66)	0.095
Atrial	15	18	1.70 (0.79–3.68)	0.174	1.09(0.38–3.11)	0.879
Heart failure	15	24	3.58 (1.57–8.21)	0.002	4.25 (1.58–	0.004*
Loss of	15	25	3.52 (1.68–7.40)	0.001	3.04 (1.25–7.44)	0.014*
Aspiration	11	33	8.39 (3.81–18.50)	<0.001	5.93 (2.46–	<0.001*
Hospital	45	38	1.76 (0.913–3.44)	0.091	1.41 (0.59–3.34)	0.428

Abbreviations: AOR, adjusted odd ratio; CL confidence interval; COR, crude odd ratio
Note: statistically significant at p-value<0.05

2) Relationship between patient socio-demographic, health seeking, treatment factors and outcomes

As patients were paired with health care providers who took part in the study, a Modified Rankin Score of 0 – 2 were considered as good outcome while a score of > 2.0 were poor outcome. Table 4.5 shows relationship between

patient socio-demographic characteristics, health seeking behaviour and treatment regime and patient outcome. Only one independent variable was statistically significantly associated with a negative outcome. Males were 80% less likely to have had a successful discharge outcome (OR: 0.2; 95% CI: 0.1 – 0.6; p = 0.002). There was an almost borderline significant association between where patient sought medical care and successful treatment outcome. Those who sought treatment in hospitals were 5.5 times more likely to have had positive treatment outcome (p = 0.08). Again, though not statistically significant patients aged up to 60 years and those married were 1.3 (p = 0.5) and 1.5 (p = 0.4) times higher odds of experiencing successful outcome.

Table: Relationship between patient socio-demographic, health seeking, treatment regime factors and outcomes

Independent variable	Categories	n	Modified Rankin Score on discharge		OR	95% CI	P value
			≤2	>2			
Gender	Male	90	5.6	94.4	0.2	0.1 – 0.6	0.002
	Female	74	21.6	78.4			
Age group in years	≤ 60	53	15.1	84.9	1.3	0.5 – 3.5	0.5
	> 60	111	11.7	88.3			
Marital status	Married	104	14.4	85.6	1.6	0.6 – 4.	0.4
	Others	60	10.0	90.0			
Level of education	None / Primary	83	13.2	86.8	1.1	0.4 – 2.7	0.9
	Secondary and above	81	12.4	87.6			
Occupation	Unemployed	92	14.1	85.9	1.3	0.5 – 3.4	0.6
	Employed	72	11.1	88.9			
Where seeks medical care	Hospital	132	15.2	84.8	5.5	0.7 – 42.9	0.08*
	Other	32	3.1	96.9			
Involved in lifestyle activities e.g. smoking	Yes	20	10.0	90.0	0.7	0.2 – 3.4	1.0*
	No	144	13.2	86.8			
On antiplatelet drugs	Yes	30	16.7	83.3	1.5	0.5 – 4.4	0.5*
	No	134	11.9	88.1			
On anticoagulants	Yes	53	9.4	90.6	0.6	0.2 – 1.8	0.4
	No	111	14.4	85.6			
On IV Thrombolytic and SON Thrombolysis	Yes	58	10.3	89.7	0.7	0.3 – 1.9	0.5
	No	106	14.2	85.8			

*Fishers Exact Test

Table presents results on the audit of key elements of stroke standard guideline as documented by health care providers who took part in the study. Facilities providing care for stroke patients should be involved in quality improvement that includes regular audits and feedback. A first step in implementing a clinical practice guideline is to gain an understanding of clinical practice. Results based on the areas audited in this particular study could assist in this process.

The findings show that out of the 18 areas audited, only 8 were documented with varying proportions, the highest being CT-Scan (92.1%) followed by oxygen saturation (89%) and FBC (71.9%), UEC (71.9%), hydration status (61.6%) and coagulation screen (51.8%) with the rest having had a either less than half of the respondents having document the parameters. The remaining 10 were not documented at all implying poor documentation system.

Table: Audit of key elements of stroke standard guideline documented

Characteristics	Categories	n	%
Level of consciousness (LOC) GCS	Yes	164	100.0
	No	0	0.0
Facial droop	Yes	164	100.0
	No	0	0.0
Speech	Yes	164	100.0
	No	0	0.0
Vision	Yes	164	100.0
	No	0	0.0
Blood pressure	Yes	164	100.0
	No	0	0.0
Temperature	Yes	164	100.0
	No	0	0.0
Respiratory rate	Yes	164	100.0
	No	0	0.0
Pulse rate	Yes	164	100.0
	No	0	0.0
Random blood sugar	Yes	164	100.0
	No	0	0.0
Hydration status	Yes	101	61.6
	No	63	38.4

Oxygen saturation	Yes	146	89.0
	No	18	11.0
Coagulation screen	Yes	85	51.8
	No	79	48.2
ESR	Yes	25	15.2
	No	139	84.8
UEC	Yes	118	71.9
	No	46	28.1
FBC	Yes	118	71.9
	No	46	28.1
Lipoprotein profile	Yes	78	47.6
	No	86	52.4
CT-Scan	Yes	151	92.1
	No	13	7.9

Audit on documentation of the indicators of adherence to standard guidelines was assessed by direct observation of patient records after health care provider had provided patient care. The direct observation was facilitated by use of a checklist to observe the care provider when managing a patient, he/she was paired with and documentation of the same in the corresponding patient records. Yes =1 was scored if the procedure was recorded and no = 0 if not recorded. Each procedure performed was given a score of none 1 while if not performed a score of zero was awarded. Total score on the 17 areas observed were added up and subjected to logistic regression analysis, the outcome being a score of greater than 2 for better life outcome and less than two for worse outcome.

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IV. DISCUSSION

The study revealed that males were more likely to suffer from stroke than females. Ischemic stroke was found to be the most common subtype among the stroke patients. High blood pressure was identified as the most prevalent risk factor for stroke in the study population. This finding is consistent with previous research indicating that hypertension is a common risk factor for stroke worldwide. However, it was noted that hypertension is often under diagnosed and poorly managed among stroke patients in Sub-Saharan

Africa, which contributes to poor treatment outcomes. Lack of awareness, limited access to healthcare, and unhealthy lifestyles were identified as potential factors contributing to this problem.

The study also highlighted the influence of socio-behavioural characteristics on stroke incidence. Urban areas showed higher stroke incidence rates compared to rural areas, possibly due to delayed care-seeking behaviours among urban dwellers who sought medical attention from private pharmacies instead of healthcare facilities. The use of herbal medicine, visits to traditional healers, and missed appointments were identified as factors contributing to delayed initiation of treatment. Lifestyle practices such as alcohol consumption and cigarette smoking were also found to be associated with stroke. Additionally, comorbid conditions such as hypertension, diabetes, and heart diseases were prevalent among stroke patients.

In terms of treatment regimen, the study discussed the stroke management protocol implemented in the selected healthcare facilities. Factors such as time from symptom onset, patient age and medical history, stroke severity, and CT scan findings were considered in determining the eligibility for specific therapies. However, the study found no statistically significant association between the use of antiplatelet, anticoagulants, IV thrombolytic, or son thrombolysis and successful stroke patient outcomes.

The study emphasized the importance of timely treatment initiation for better stroke outcomes. However, none of the study participants received thrombolytic drugs due to a lack of coordinated emergency medical treatment and availability of TPA. Prescriptions for antiplatelet medication (aspirin) and lipid-lowering drugs were the most common during hospitalization. It was noted that ACEIs were the most frequently prescribed antihypertensive drugs for stroke patients. Poor treatment outcomes were observed in approximately 40% of stroke patients, which was relatively lower compared to previous studies in Ethiopia. Factors associated with poor treatment outcomes included older age, altered level of consciousness, comorbid heart failure, and complications from aspiration pneumonia.

The study also evaluated the adherence to stroke management guidelines among healthcare providers. It was found that the participants had a moderate level of knowledge regarding stroke management. Possible reasons for this moderate knowledge level include a lack of training on updated stroke management, inadequate clinical practice, and a lack of commitment by unit managers to implement stroke guidelines.

In conclusion, this study provides valuable insights into the treatment outcomes and associated factors for hospitalized stroke patients in Kakamega County, Kenya. The findings emphasize the importance of addressing risk factors such as hypertension and promoting timely treatment initiation for improved stroke outcomes. The study also highlights the need for increased awareness, access to healthcare, and adherence to stroke management guidelines among healthcare providers. Further research and interventions are warranted to enhance stroke care and reduce the burden of stroke in the region.

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