

## In Hospital Outcomes of Stroke Patients Admitted to Al-Wahda Teaching Hospital, Yemen: Retrospective Study 2019-2023

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### Abstract

**Background:** Stroke is a major public health issue worldwide, but data on stroke in Yemen is limited. This study aimed to characterize the clinical pattern and outcomes of stroke patients admitted to Al- Wahda Teaching Hospital

**Methodology:** This retrospective cross-sectional study was conducted on 288 medical records of stroke patients admitted to Al-Wahda Teaching Hospital from 2019 to 6/2023. Information extracted included sociodemographics, stroke type, risk factors, clinical presentation, treatments, length of stay, complications, and outcomes.

**Results:** Ischemic stroke accounted for 74.3% and hemorrhagic stroke for 25.7% of cases. Males comprised 66.3% and females 33.7% of patients. Hypertension (63.2%) and diabetes mellitus (32.6%) were the most common risk factors, while 41.3% reported khat chewing. Median length of hospitalization was 8.6 days. In-hospital mortality was 13%. Hemorrhagic stroke and hypertension were associated with higher mortality.

**Conclusions:** This study demonstrates a high prevalence of modifiable risk factors, particularly hypertension, and considerable in-hospital mortality. Larger prospective studies are needed to confirm stroke epidemiology in Yemen. Public health efforts should focus on improving awareness and management of hypertension to prevent stroke. Health facilities require enhanced capacity for diagnosis, acute care, and rehabilitation. The potential association between khat chewing and stroke warrants further research. Our findings highlight the need for a coordinated national response to reduce the burden of stroke in Yemen.

**Keywords:** Hemorrhagic Stroke, In-Hospital Mortality, Ischemic, Risk Factors

### 1. Introduction

Stroke is an important health problem worldwide and poses a huge burden on the community health purse as well as on patients and their relatives [1,2]. The global burden and clinical outcomes of stroke epidemiology are changing rapidly [3]. Globally according to the American Heart Association (AHA) report of 2016, stroke accounts for 11.8% of total deaths and ranked second leading cause of death next to heart disease in 2013 [4].

First-time incidence of stroke occurs almost 17 million times per year worldwide which is approximately one every 2 s [5].

Stroke remains one of the most devastating and disabling of all cerebrovascular diseases with a significant amount of residual deficit leading to economic loss [6, 7]. The burden of stroke is high and is not only attributable to its high mortality but also its consequent high morbidity and physical disability [6, 8]. Globally One in six people have a stroke in their lifetime and patients younger than 50 years account for 5–10% of all strokes [9].

The global burden of disease study also indicated that 80% of stroke deaths occur in low and middle-income countries (LMICs), showing that the developing world carries the highest burden of stroke mortality, morbidity, and stroke-related disability [10, 11]. Due to changes in public exposure to risk factors and the

inability to afford high cost of care, the poor are increasingly affected by stroke [2]. Major problems shared by many countries of developing are a lack of infrastructure, poor systems of health care, lack of effective programs to address risk factors, shortage of adequately trained manpower, and lack of other resources to combat the epidemic [12,13].

Despite the high burden of strokes worldwide, there is insufficient information on the current epidemiology, prevention, management, and outcome of stroke in Yemen and other LMICs [13,14]. This paucity of information has limited research output and consequently, the way to overcome this burden in developing countries [15]. Hence, this study aimed to assess the clinical pattern and stroke treatment outcomes among hospitalized patients who had a stroke at the medical ward of Al-Wahda Teaching Hospital-Yemen.

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## 2. Materials and Methods

### 2.1 Study Settings

The present study was carried out at Al-Wahda Teaching Hospital, Tamar University, in Ma'abar city, Dhamar governorate, Yemen. Data was collected in 2023.

### 2.2 Study Design

A retrospective cross-sectional study. The study included medical records with complete patient information and a stroke diagnosis that had been verified using imaging techniques from January 2019 to Jul/ 2023.

### 2.3 Sample Size

The sample size was determined using Epi Info 7 with the help of a single population proportion formula, taking into account the expected mortality proportion amongst stroke patients who were hospitalized at 21%, a 95% confidence level, and a 3% margin of error [36]. Which came out to be 288 cases.

### 2.4 Study Population

The study population was all stroke patients admitted to the

medical Ward of Al-Wahda Teaching Hospital during the study period.

### 2.5 Study Tools

The data abstraction format was adapted from various relevant literature and further modified based on the pretest result. The format contained socio-demographic patient characteristics, clinically related information, previous medications used, comorbidities, complications, time from onset of symptoms to hospitalization, length of hospital stay, type of stroke and treatment outcome status. These data were collected from the patient's medical records.

### 3. Data Collection

Six trained sixth-year medical students (males and females) collected data

#### - Inclusion Criteria

Stroke cases were confirmed using computerized tomography scan or magnetic resonance imaging and admitted to the medical ward of Al-Wahda Teaching Hospital during the study period.

#### -Exclusion Criteria

Medical records with incomplete required information were excluded from the study.

### Data Analysis

The extracted data were reviewed, cleaned, and entered into SPSS version 25 software for analysis. Descriptive statistics were used to characterize the frequency and percentage of sociodemographic factors and other variables. The results were presented in the form of texts, tables, and figures.

## 4. Result

A total of 288 stroke patients' medical record were reviewed. Males were accounted for 191 (66.3%) and female was 33.7%. The majority of participants (49.7%) were ages less than 40. In addition, 77.1% of the participants were from rural areas, making up two-thirds of the study participants. Additionally, 134 (46.6%) patients attended primary education and 70 (24%) were Illiterate.

Variables	Category	Frequency	Percent
Gender	Male	191	66.3%
	Female	97	33.7%
Age	<40 years	143	49.70 %
	40 – 70 years	70	24.30%
	> 70 years		26.00%
Family history of stroke	Yes	24	8.3%
	No	264	91.7%
Special habits	No special habits	102	35.4%
	Chewing Khat	119	41.3%
	Smoking	67	23.3%
Previous vascular event	No previous history	207	71.9%
	Peripheral vascular disease	3	1.0%
	Cerebrovascular accidents	68	23.6%
	Myocardial infraction	10	3.5%
Drugs intake	No drugs use	191	66.3%
	Oral contraceptive	20	6.9%
	Hormone replacement therapy	9	3.1%
	Others	73	25.3%
Comorbid status	Absents	38	13.2%
	Present	250	86.8%
Specific comorbid conditions*	Hypertension	182	63.2%
	DM	94	32.6%
	Hyperlipidemia	24	8.3%
	Atrial fibrillation	17	5.9%
	Heart failure	56	19.4%
	Others**	13	4.4%
* Multiple choice questions			
** (acute renal failure, cardiomyopathy, Infective endocarditis, Rheumatic fever, Mitral stenosis)			

**Table 1:** Sociodemographic and Risk Factors in Stroke Patients Who Had a Stroke Hospitalized At Al-Wahda Teaching Hospital (n=288)

About 41.3%, 35.4%, and 23.3% of the study participants were Khat chewers, had no special habits and cigarette smokers, respectively. Furthermore, about 8.3% of the study participants had previous history of stroke.

Our study reveal that, 23.6% of patient had history of Cerebrovascular accidents, 3.5% had MI and 1% had Peripheral vascular disease. Majority of patient don't take any drugs before stroke event and 6.9% used Oral contraceptive. Moreover, two-third of patients (250, 86.8%) had at least one comorbid condition, hypertension was the most prevalent condition seen in 63.2% of the study participants.

About two-thirds of the patients (214, 74.3%) were diagnosed with ischemic stroke, while 74 (25.7%) had a hemorrhagic stroke. The time from the onset of symptoms until arrival at the hospital for most patients was <12 hours. In addition, the median length of hospital stay was 8.6±6.4days, and one-third of the patients (100, 34.7%) remained in the hospital for nine or more days. Approximately, one-third of patients who had a stroke complained right-sided body weakness (112, 38.8%), followed by left side body weakness (106, 36.7%) and Loss of consciousness (100, 34.7%)

Variables	Category	Frequency	Percent
Type of stroke	Ischemic	214	74.3%
	Hemorrhagic	74	25.7%
Time between the onset of symptoms and admission	<12h	105	36.5%
	12-24 hours	98	34.0%
	25-48 hours	19	6.6%
	>48 hours	66	22.9%
Clinical presentation*	Right side body weakness	112	38.8%
	Left side body weakness	106	36.7%
	Loss of consciousness	100	34.7%
	Aphasia	91	31.5%
Length of stay in hospital	1 – 3 days	43	14.9%
	4 – 6 days	80	27.8%
	7 – 9 days	65	22.6%
	> 9 days	100	34.7%

**Table 1:** Clinical Characteristics of Patients Who Had a Stroke Hospitalized at Al-Wahda Teaching Hospital (n=288)

The study participants also had DM (32.6%), Heart failure (19.4%) and Hyperlipidemia (8.3%). As shown in Table 1.

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right-sided body weakness (112, 38.8%), followed by left side body weakness (106, 36.7%) and Loss of consciousness (100, 34.7%) more than half of the patients who had a stroke (162, 56.3%) were discharged with Improved, Discharge against medical advice and 13.2% were died. The complications reported in 38.5% of the patients. The most common complications of stroke were elevated intracranial pressure (30, 10.4%),

Recurrence (55, 19.1%), Seizure (21, 7.3%) and Aspiration pneumonia. Table (3,4)

Variables	Category	Frequency	Percent
Complications	Yes	111	38.5%
	No	177	61.5%
Specific complications	Increase ICP	30	10.4%
	Seizure	21	7.3%
	Recurrence	55	19.1%
	Aspiration pneumonia	14	4.9%
	Other*	10	3.4%

\* (Septic shock, Bed sore)

**Table 3:** Distribution of Patients with Stroke by Their Complications

Variables	Improved		Died		Discharge against medical advice		Leave against medical advice	
1 – 3 days	10	6.2%	3	34.2%	15	19.5%	5	45.5%
4 – 6 days	43	26.5%	8	21.1%	25	32.5%	4	36.4%
7 – 9 days	41	25.3%	5	13.2%	18	23.4%	1	9.1%
> 9 days	68	42%	12	31.6%	19	24.7%	1	9.1%

**Table 2:** Distribution of Patient Outcomes by Duration of Hospital Stay

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## 5. Discussion

Stroke and other chronic, non-communicable illnesses are becoming major global public health issues. Stroke remains to be the most prevalent neurological illness among patients admitted to hospitals in Yemen. Regarding the stroke management in Yemen, the country lacks well-run public health-care facilities such as rehabilitation facilities and stroke units with MRI/CT capabilities. Furthermore, given the state of the economy, the government is unable to provide thrombolysis therapy, which is the gold standard of care for acute ischemic stroke [17].

The age distribution of stroke in our research was in line with those of previous comparable studies carried out in USA, Ethiopia and Hyderabad where the majority of stroke patients were under the age of 34 [1]. As noted, about 66.3% of the patients involved in this study were male, which is consistent with studies from Saudi Arabia, India, Ethiopia, and Kenya [18-21]. The global trend toward male dominance is not fully understood but could be partly explained by the fact that hypertension, diabetes mellitus, smoking, and alcoholism are more common among male patients [17].

The results of this study are consistent with the previous local studies [22-24], which showed that ischemic stroke was the most frequent form, followed by hemorrhagic stroke. This is consistent with studies from Saudi Arabia, India, Ethiopia, and Kenya, but unlike a study conducted at St. Paul Hospital, which found that hemorrhagic strokes made up 61.3% of cases, making them more frequent than ischemic strokes [18-21,25].

As noted in this study, hypertension, which accounts for 81% of cases, was the major risk factor associated with stroke. This finding is consistent with earlier studies conducted in hospital settings in Yemen [22-24] and other Arab and African countries [18,25-29]. The degree of mental stress brought on by poverty and instability, particularly after the civil war, is probably closely correlated with the frequency of hypertension. The fact that many of our patients had poor blood pressure management caused by non-adherence to treatment due to cost and drug availability certainly increased the significance of hypertension control. As noted in this study, diabetes mellitus ranked second on the list of risk factors as did other hospital studies in Saudi Arabia, India, Ethiopia, Kenya, Yemen, Egypt [18,20-23, 25-27, 29].

In the present study, khat chewing was reported in 35.4% of cases, which is lower than in a prior study [23]. Chewing Khat is a common habit in Yemen. It is estimated that up to 90% of adult men and 73% of adult women chew khat for 3–4 h daily in this country. In addition, 15–20% of children under the age of 12 are also daily consumers [30].

Khat is a stimulant made from the leaves of the plant *Catha edulis*. Some reports from Yemen [31,32] observed a correlation between khat chewing habit and cardiovascular diseases. Although these studies have significant limitations, they highlight the necessity for

additional large-scale trustworthy studies to confirm the relevance of khat chewing as a risk factor for cardiovascular disease, including stroke.

This study showed that almost one-third of the patients who had a stroke complained right-sided body weakness. Previous studies in Ethiopia and Gambia have also shown that left side body weakness is the most frequently reported clinical presentation [33,34]. On the other hand, studies conducted by Shenkutie Greffie et al, Gedefa et al and Masood et al reported that patients with stroke had motor-related symptom and focal neurological deficit [35-37]. This disparity probably could be due to different site of infarction. In-hospital mortality ranges between 2.8% and 46% [16,22,29]. In-hospital mortality in the present study was 13%, which falls within the global range. Many risk factors for in-hospital mortality were identified. Russell et al. found the following variables as independent risk factors for in-hospital mortality: hypertension, previous stroke, Glasgow coma scale diagnosis in the absence of imaging, hemorrhagic stroke, and aspiration pneumonia. While Kamabu et al. found hemorrhagic stroke, hospital arrival delay of more than 24 h, poor compliance to anti-diabetic medication, recurrent stroke, poor compliance to antihypertensive therapy, and the advanced age >75 years as independent predictors of in-hospital mortality [38,39].

## 6. Conclusion

Stroke is a major problem in Dhamar Governorate with ischemic stroke being more than hemorrhagic. Men were more likely to have a stroke than women and majority of cases were younger. Hypertension, diabetes mellitus, smoking, and were the most commonly identified risk factors that were significantly associated with stroke. Hemorrhagic stroke and presence of hypertension were found as risk factors for in-hospital mortality; therefore, hypertension should be well controlled to reduce in-hospital mortality.

### 6.1 Public Health Initiatives for Hypertension Control

Given the high prevalence of hypertension among stroke patients, enhancing public health efforts aimed at controlling blood pressure could significantly reduce stroke incidence and mortality in Yemen.

### 6.2 Improvement in Acute Stroke Care and Rehabilitation

The hospital infrastructure needs to be improved, particularly in stroke units and rehabilitation services. Enhancing the availability of imaging techniques (CT, MRI) and thrombolytic therapy would improve outcomes for ischemic stroke patients.

### 6.3 Further Research on Khat Chewing

Since a significant portion of the study population reported chewing khat, and there may be a link between this habit and stroke, more comprehensive studies are needed to assess the cardiovascular risks associated with khat consumption.



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