

Incidence and pattern of stroke among patients admitted to medical ward at Yirgalem General Hospital, Sidama Regional State, Southern-Ethiopia

SAGE Open Medicine

Volume 9: 1–7

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DOI: 10.1177/20503121211001154

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Abstract

Introduction: In the current days, stroke has become one of the common reasons for admission in many health care setups and becoming an alarming public health problem in Ethiopia. Hence, this study aimed to assess the incidence and associated factors of stroke among patients admitted to the medical wards in Yirgalem hospital.

Methods: An institution-based retrospective cross-sectional study design was carried out from 01 January 2017, to 30 December 2019. Admitted adult patients' medical charts were used to collect all required information using structured checklists. Data were analyzed using statistical package for social sciences (SPSS) version 20 software, and a p value < 0.05 was accepted as statistically significant.

Result: From a total of 3016 admitted patients, the incidence of stroke was 3.15% ($n = 95$). Of the 95 stroke cases, 58.9% were males and 69.5% of them were urban dwellers. 62.1% (59/95) of the stroke patients had an ischemic stroke, whereas 37.9% (36/95) had a hemorrhagic stroke. Patients with age ≥ 65 years, smokers, hypertension, and type-II diabetes had significantly higher ischemic stroke when compared to patients with hemorrhagic stroke (62.7% vs 30.5%, $p = 0.008$), (49.1% vs 11.1%, $p \leq 0.0001$), and (71.2% vs 13.9%, $p < 0.0001$), respectively. While patients with hypertension had a significantly higher rate of hemorrhagic stroke when compared to patients with ischemic stroke (88.9% vs 61%, $p = 0.003$).

Conclusion: The majority of stroke patients had cardiovascular problems and hypertension. More than 44% and 34.7% of them had a history of alcoholism and smoking. Therefore, proper management of hypertension, lifestyle modification, early screening and management of stroke risks and avoiding risk-full personal behaviors like smoking and alcoholism are important tools to limit or prevent stroke-related morbidity and mortality.

Keywords

Medical ward admission, ischemic stroke, haemorrhagic stroke, Yirgalem

Date received: 3 February 2021; accepted: 15 February 2021

Introduction

Stroke ranks as the third leading cause of death in the world, with 5.8 million deaths annually. It is now being documented as a significant reason for deaths in Sub-Saharan Africa (SSA).¹ The global incidence of stroke is estimated to be approximately 15 million new stroke cases per year, of these, two-thirds of which happen in low- to middle-income countries,^{2,3} and it is highly fatal in SSA countries which indicated that 85% of death due to stroke occurred in SSA.^{3,4} It causes mortality, morbidity, and disability, and the situation is currently increasing in the world.^{5,6} According to the

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classification of the American Heart Association report, stroke can be subtype into ischemic and hemorrhagic and their occurrence rate is about 87% and 13%, respectively. The ischemic type of stroke fatality rate was less than the hemorrhagic type of stroke.⁷ The trend of stroke incidence showed a 40% reduction especially in developed countries; however, it increased abruptly in areas of developing countries.^{8,9} According to the 2014 World Health Organization (WHO) report, 28,320 people died in Ethiopia due to stroke, which accounts for 4.71% of the total deaths.¹⁰ Currently almost 24% of all neurological related admissions in the hospitals of Ethiopia are due to the problem of stroke.^{11,12} The risk factors of stroke are classified as either modifiable or non-modifiable. Age, sex, family history, and race/ethnicity are categorized under the group of non-modifiable risk factors; while hypertension, smoking, diet, and sedentary lifestyle are some of the recognized modifiable risk factors.^{13,14} In addition, the knowledge gap leads to low compliance in making use of preventive programs.^{15,16} Moreover, stroke has nowadays become one of the commonest reasons for admission in many health care setups and an alarming serious public health problem in Ethiopia.^{17,18} Ischemic stroke has been identified as the sixth leading cause of death in Ethiopia.¹⁹ Assessment of epidemiology, pattern, risk factors, and the clinical presentation of stroke is still compulsory to get more information about stroke occurring in Ethiopia, but they are not known well yet, especially stroke in south Ethiopia. Therefore, this study aimed to assess the incidence and pattern of stroke among patients admitted to the medical ward at Yirgalem General Hospital.

Methods

Study setting, design, and study population

The study was conducted in Yirgalem General Hospital, Sidama Regional State, which is about 315 km from Addis Ababa, the capital city of Ethiopia. The hospital serving more than 4.3 million population in the catchment area and nearby zones of the Oromia region and Gedeo zone population. The hospital has the following departments: Medical, Surgical, Pediatrics, and Gynecology/Obstetric wards. Besides, the hospital has special care units like the Medical Intensive Care Unit, Neonatal Intensive Care Unit, and surgical recovery Room and clinics like Eye, Antiretroviral Therapy, Dental, TB, and MDR-TB clinics. Currently, it has 251 functional beds, and 180 health care workers (specialists, dentists, general practitioners, health officers, laboratory technicians and technologists, nurses, and other discipline staff). It provides health services at both in-patient and out-patient levels. An institution-based retrospective cross-sectional study design was carried out among 3016 adult patients who were admitted to medical wards in the hospital from 01 January 2017 to 30 December 2019. Concerning the provision of healthcare service: patients get the healthcare service with a charge of pocket money, while the hospital provides payment-free healthcare service only for patients who obtain an official confirmation letter from their residence administrative

office to be free of health care service charge due to low economic status and or other issues. The imaging diagnostics like X-ray, ultrasonography, echocardiography, and electrocardiogram (ECG) are available in the hospital, while there are no computed tomography (CT) scan and magnetic resonance imaging (MRI) diagnostic services. If patients requested diagnostic imaging like CT scan and MRI, they travel about 35 km (to Hawassa city) to get the diagnostic service in the private and or government institution. All adult patients who were admitted to the medical ward were the source of the study population. Moreover, populations from nearby zones of Oromia and Gedeo zone also receive healthcare service from this hospital in addition to Sidama populations (Figure 1).

Data collection and assessments

Data on socio-demographic variables such as age, sex, clinical data like stroke, diabetes mellitus (DM), hypertension, cardiovascular diseases, dyslipidemia, and lifestyle and behavioral information such as alcohol intake and smoking were collected from medical records/charts of the admitted patients using structured checklists.

Operational terms

Stroke: an episode of acute neurological dysfunction presumed to be caused by ischemia or hemorrhage, persisting ≥ 24 h or until death, but without sufficient evidence to be classified as one of the above.²⁰

Ischemic stroke: An episode of neurological dysfunction caused by focal cerebral, spinal, or retinal infarction.²⁰

Hemorrhagic stroke: A stroke that happens when an artery in the brain leaks blood or ruptures (breaks open). The leaked blood puts too much pressure on brain cells, which damages them.

Hypertension: Patients were previously diagnosed and receiving antihypertensive medication or diagnosed with hypertension that indicated blood pressure of $\geq 140/90$ mm/Hg.

Dyslipidemia: Patients using lipid-lowering medication or previously diagnosed and had hyperlipidemia (total cholesterol ≥ 200 mg/dL, low-density lipopolysaccharide (LDL) cholesterol ≥ 1030 mg/dL, and high-density lipopolysaccharide (HDL) cholesterol < 40 mg/dL for men or < 50 mg/dL for women, and or serum triglyceride ≥ 150 mg/dL).

Diabetes mellitus (DM): If the patient was previously on oral hypoglycemic agents/insulin treatment or diagnosed and had DM (fasting blood sugar (FBS) level ≥ 126 mg/dL or had documented random blood sugar (RBS) level ≥ 200 mg/dL, or glycosylated hemoglobin of $\geq 6.5\%$).

Inclusion and exclusion criteria

All newly registered and admitted patients in the medical wards from 01 January 2017 to 30 December 2019 with age greater than or equal to 18 years old were included in the study. However, those admitted patients whose record was

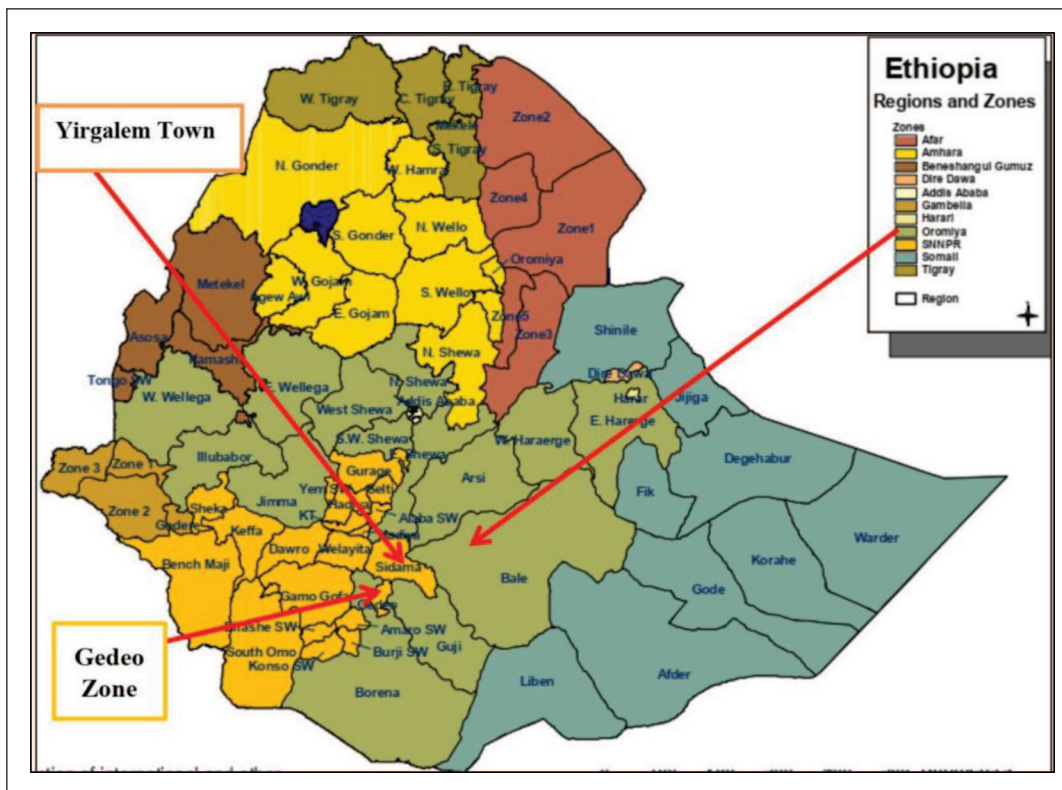


Figure 1. Location of the Yirgalem Hospital (Yirgalem Town) in Sidama Regional State.

incomplete for the evaluation of stroke pattern and those patients whose medical records absent in the archives room when tracing were not included in this study.

Data analysis

Data were coded and entered into a statistical package for social science (SPSS) version 20 for statistical analysis. Descriptive statistics were used to summarize the features of study participants. In addition, the chi-square test was used to compare categorical variables and a p value <0.05 was accepted as statistically significant. Finally, the results were presented by frequency and percentage using tables.

Results

Out of the total 3016 medical wards admitted patients, 6 records were incomplete for the assessment of stroke pattern and 95 (3.15%) of patients had a stroke, which was diagnosed by physical as well as diagnostic imaging (Echo, ECG, CT scan, and MRI). Of 95 patients with stroke, 56 (58.9%) were males, 39 (41.1%) were females, and 69.5% were urban dwellers (Table 1).

The features of stroke disease

Of the stroke patients, 59/95(62.1%, 95% confidence interval (CI): 51.3–71.6) had an ischemic stroke, whereas 36/95(37.9%, 95% CI: 29.5–46.9) had a hemorrhagic stroke. Regarding the diagnosis of stroke, 65.3% (62/95) cases were confirmed by imaging diagnostics (53 patients by CT and 9 by MRI). While the remaining 34.7% (33/95) cases were identified by clinical diagnosis.

Cardiovascular disease was the most coexisting morbidity among stroke patients and that accounted for 73.7%, followed by hypertension (71.6%) and DM (60%) (Table 2). Regarding hypertension, 91.6% (33/36) of hemorrhagic stroke patients and 61% (36/59) of ischemic stroke patients had hypertension. Besides, 94.4% of patients with hemorrhagic stroke also had cardiovascular comorbidities, of these, 16.6% was ischemic heart disease (IHD), 75% was hypertensive heart disease (HHD), and 2.8% was valvular heart disease (VHD). On the contrary, 61% of patients with ischemic stroke had cardiovascular risk factors, of these, 28.8% was IHD and 27.1% was HHD. More than three-fourth (79.6%, n = 47) of patients with ischemic stroke had DM, particularly type 2 DM accounted for 71.1% (Table 3).

Table 1. Sociodemographic characteristic of stroke patients.

Variable	Categories	Number	Percentage
Age in years	Mean \pm SD (minimum to maximum)	66.2 \pm 10.8 (46–97)	
	<50 years	6	6.3
	50–65 years	41	43.1
	>65 years	48	50.6
Sex	Males	56	58.9
	Females	39	41.1
Residency	Urban	66	69.5
	Rural	29	30.5
Ethnicity	Sidama	58	61.1
	Amhara	21	22.1
	Oromo	5	5.3
	Others	11	11.6
Occupation	Farmer	36	37.9
	Merchant	41	43.2
	Government employee	18	18.9

SD: standard deviation.

The pattern of stroke in relation to the study variables

Hemorrhagic stroke was found to have highly prevalent among patients aged between 50 and 56 years (58.3%) and the rate was higher in males when compared to females (61.1% vs 38.9%, respectively). However, 62.7% of the patients with ischemic stroke were aged greater than or equal to 65 years and the rate also was higher in males when compared to females (57.6% vs 42.4%, respectively). The prevalence of HTN was significantly lower among patients with ischemic stroke when compared to patients with hemorrhagic stroke (61% vs 88.9%, $p = 0.003$), respectively. In addition, patients with ischemic stroke had a higher rate of type-II DM compared to patients with hemorrhagic stroke (71.2% vs 13.9%, $p < 0.0001$), respectively. HHD was significantly higher among patients with hemorrhagic stroke when compared to patients with ischemic stroke (75% vs 27.1%, $p < 0.0001$), respectively. Moreover, more than 49% of patients with ischemic stroke, and 11% patients with of hemorrhagic stroke had a history of smoking (Table 3).

Discussion

In this study, the overall incidence of stroke was 3.15% and the rate was lower than the report of different studies conducted in Ethiopia like 19.3%,²¹ 7.7%,²² 7.5%,²³ and 7.2%.²⁴ Lack of the diagnostic technology such as MRI or CT scan and manual registration and management system of records in the study hospital might have an association with lower rates of stroke patients. In addition, lack of stroke awareness might lead to a lower consultation rate. Even though patients notice the stroke symptom, they might not go to the hospital or reject

Table 2. Prevalence of comorbid problems among patients with stroke.

Comorbid disease	Presence of comorbidity	
	Yes (n = 95)	
	Frequency	Percent (%)
Hypertension	68	71.6
Cardiovascular diseases		
Ischemic heart diseases (IHD)	22	23.2
Hypertensive heart diseases (HHD)	44	46.3
Valvular heart disease (VHD)	4	4.2
Type of diabetes mellitus		
Type-I	10	10.5
Type-II	47	49.5
Alcoholism	42	44.2
Smoking	33	34.7
Presence of dyslipidemia	11	11.6

Table 3. Features of stroke with the study variables.

Variable	Category	IS 59 (%)	HS 36 (%)	p value
Age, years	<50 years	2 (3.4)	4 (11.1)	
	50–65 years	20 (33.9)	21 (58.3)	
	65+ years	37 (62.7)	11 (30.5)	0.008
Smoking	Yes	29 (49.1)	4 (11.1)	<0.0001
Diabetes mellitus	Type-I	5 (8.5)	5 (13.9)	
	Type-II	42 (71.2)	5 (13.9)	<0.0001
Residence	Rural	21 (35.6)	8 (22.2)	
	Urban	38 (64.4)	28 (77.8)	0.17
Sex	Male	34 (57.6)	22 (61.1)	
	Female	25 (42.4)	14 (38.9)	0.74
Hypertension	Yes	36 (61.0)	32 (88.9)	0.003
Dyslipidemia	Yes	5 (8.5)	7 (19.4)	0.12
Alcoholism	Yes	27 (45.8)	15 (41.7)	0.69
Cardiovascular diseases	IHD	17 (28.8)	6 (16.7)	
	HHD	16 (27.1)	27 (75)	
	VHD	3 (5.1)	1 (2.8)	<0.0001

IS: ischemic stroke; HS: hemorrhagic stroke; IHD: ischemic heart disease; HHD: hypertensive heart disease; VHD: valvular heart disease.

admission because of their financial problems. Moreover, majority (58.9%) of the stroke patients were males, and it was similar with the report of different studies.^{18,21,23,25}

In this study, 71.6% of the stroke patients were comorbid with hypertension. In similar, the study conducted in Southwest Ethiopia indicated that 75.9% of the stroke patients had hypertension.²⁶ In addition to this, different studies indicated the association between hypertension and stroke.²⁷ This might reflects the economic burden especially in proper medical follow-up and treatment, and inadequate awareness of hypertension might consequence poor controlling status of the disease. The second comorbid disease with stroke was type-2 diabetes (49.5%). Likewise the pooled prevalence report from

SSA indicated that diabetes and HIV were at a suggestively greater risk of suffering from all stroke types.²⁸

In this study, the incidence of ischemic stroke was 62.1 % (95% CI: 51.3–71.6), and it was a frequently encountered subtype of stroke. Likewise, several studies reported that ischemic stroke was the dominant subtype of stroke.^{21–24,26,27,29–33} However, some studies reported that hemorrhagic stroke is the dominant subtype of the stroke in other parts of Ethiopia.^{12,25,12} Patients in this study were more likely to have risk factors associated with ischemic stroke and this might be a reason for the variation. In addition, a higher rate of ischemic stroke might relatively affect the lower rate of hemorrhagic stroke.

In this study, patients with ischemic stroke had a significantly high rate of type-II diabetes (71.2%) and the finding was in line with the report of other studies.^{24,29,34–36} This might be due to the higher rate of microvascular disease complication and the co-existence of hypertension seen more in diabetes patients.

In this study, 37.9% of the stroke patients had a hemorrhagic stroke. Comparatively, the study conducted in Zambia indicated that 35% of stroke patients had hemorrhagic strokes.³⁷ However, the higher rate of hemorrhagic stroke was reported in different studies that conducted in Ethiopia like 49.7% at Hawassa,³⁸ 59.2%,³⁹ and 56%²⁰ at Tikur Anbessa Teaching Hospital. This variance might be related to patients' hypertension management conditions between the studies. Better hypertension management might be associated with a lower rate of hemorrhagic stroke than other studies.

This study revealed a significantly high rate of HHD (75%) among patients with hemorrhagic stroke, and the majority (88.9%) of patients with hemorrhagic stroke had hypertension. The studies revealed that the most common causes of hemorrhagic stroke are hypertension, bleeding diatheses, amyloid angiopathy, drug misuse, and vascular malformations.⁴⁰ Besides, hypertension can damage the arteries and form weak places that rupture easily (aneurysm) which leads to hemorrhagic stroke.⁴¹

Limitations

This study was retrospective by its approach, used secondary data, and focused on documented information from patients' records. This study conducted on institution-based records review, some important information could not be found, and others were incomplete. In addition, a power calculation was not performed to determine sample size instead, all records that contain full information were reviewed based on the study period (from 01 January 2017 to 30 December 2019).

Conclusion

The incidence of stroke among patients who attended Yirgalem general Hospital was lower when compared with the prior studies conducted elsewhere. More than half of stroke patients were males and more than 69% were urban dwellers. In

addition, majorities of the stroke patients had cardiovascular problems and hypertension; more than 44% and 34.7% of the patients had a history of alcoholism and smoking. Therefore, proper management of hypertension, lifestyle modification, early screening and management of stroke risks, and avoiding riskful personal behaviors like smoking and alcoholism are important to prevent stroke-related morbidity and mortality.

Acknowledgements

The authors show their gratitude to Yirgalem general hospital records and archive room staffs for their support during data tracing and Yirgalem Hospital medical College for providing them this research opportunity.

Author contributions

Study concept and design was performed by M.A.; acquisition of data was done by M.A. and D.E.; advising was given by B.G., A.A., A.H., and D.D.; statistical analysis and interpretation of data was performed by M.A., N.Y., and A.P.; drafting of the manuscript was performed by A.T.H. and D.E.; critical revision of the manuscript was given by A.T.H.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical approval for this study was obtained from Research and Ethics Committee of Yirgalem Hospital Medical College, Ref No: Y.M.C/155/160/3142

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

The ethics committee waived the need for informed consent because the research could not be possible to conduct without the waiver, had vital social value, and posed no more than insignificant risks to the study participants. But, confidentiality of the study participants' personal information was well-kept.

Availability of data

The data set of this article is accessible on reasonable request from the corresponding author with the authorization of Hawassa city, Health Department Office.

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