

# Management Outcome, Mortality and Factors Associated with Mortality Amongst Hospitalized Patients with Stroke. A Cross Sectional Study.

Solomon Weldegebreal (✉ [s.weldegebreal@gmail.com](mailto:s.weldegebreal@gmail.com))

Mekelle University College of Health Sciences

**Kiday Gidey**

Mekelle University College of Health Sciences

**Kidu Gidey**

Mekelle University College of Health Sciences

**Yirga Legesse Nirayo**

Mekelle University College of Health Sciences

**Desilu Mahari Desta**

Mekelle University College of Health Sciences

**Tesfay Mehari Atey**

Mekelle University College of Health Sciences

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## Research article

**Keywords:** Outcome, Mortality, Factors

**Posted Date:** January 14th, 2020

**DOI:** <https://doi.org/10.21203/rs.2.20816/v1>

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# Abstract

**Background** Outcomes, mortality due to stroke and factors related with mortality are not profoundly known in the northern Ethiopia. Hence, the main purpose of the study was to assess management outcome, mortality and factors associated with mortality amongst stroke patients.

**Methods** A cross sectional study design was used to conduct the study. Patients medical chart were utilized to collect patient information. Patients medical registries who were diagnosed with stroke and treated in Ayder Comprehensive Specialized Hospital over the years were retrospectively seen. Sample size was estimated using single population formula. Medical charts have been assigned a number and patients were selected using systematic random sampling technique. The findings were analyzed using SPSS version 22. Using logistic regression analysis factors associated with mortality in hospital were identified. A P value less than 0.05 were deemed to be significant in all types of analyses.

**Results** About 216 patients with the diagnosis of stroke were studied. Of the total patients studied, 126(58.3%) were females. From the total stroke patients analyzed, 102(47.2%) were discharged with improvement, 44(20.4%) left against medical advice, and 22(10.2%) patients discharged with no change. Moreover, about 48(22.2%) patients died in the hospital. The median time to death was 3 days ranging from 1 to 48 days and the average mean time to death was  $6.2 \pm 8.7$  days. One hundred thirty-six (62.9%) patients had affirmed to have at least one complication during their hospital stay. The total frequency of complication detected was 234 in number and aspiration pneumonia ( $n=92$ , 39.4%) was the frequently identified complication. Sever (3-8) record of Glasgow coma scale (GCS) at admission (Adjusted Odds Ratio=15.33, 95%CI:3.77-62.40,  $p=0.001$ ) and being unconscious (AOR=2.61, 95%CI:1.06-6.40,  $p=0.037$ ) during admission were positively associated with mortality.

**Conclusion** Substantially higher number of patients died at the hospital. Majority of the patients admitted to the hospital developed complication, aspiration pneumonia being the most frequently affirmed complication during their stay in the wards. Patients with severe GCS and who were unconscious during admission were more likely to die at the hospital. Sketching out strategies to solve the problem will be conducive for the patients with stroke.

## Background

Stroke constitutes and attributes for a major global health problem, and is the second most common cause of death and among the leading causes of disability in the world (1–4). The prevalence's and incidences of stroke case in 2016 amounted to nearly 83 million and 13.6 million, respectively (3). About 15 million people suffer with stroke each year and nearly six million people worldwide die from stroke every year. Globally, it is speculated that one in six people will have a stroke in their lifetime (5). Studies has estimated a disability adjusted life years from a stroke to be over 87% in low and middle income countries (6). Moreover, stroke is attributable for more than 4% of direct healthcare costs in high-income

countries (2). In Ethiopia, stroke was also attributed to premature deaths from non-communicable diseases (7).

In Africa, there is a paucity of comprehensive surveillance statistical data of stroke prevalence. Albeit, the extant reports showed that mortality and prevalence of disabling stroke in Africa are similar to or higher than the developed countries (8). In 2009, the estimate of new stroke case amongst people 15 years old and older was 483 thousand, which is equivalent to 81.2 (13.2–94.9)/100,000 person years. The incidence of new case scaled up by 10.8% which made the estimated new stroke case to be 535 thousand on 2013 (9). Moreover, some community-based research's illustrated that an age-standardised annual stroke incidence rate and prevalence accounted up to 316 per 100,000 population, 981 per 100,000, respectively (10). Despite, its higher prevalence and incidence, the outcome of stroke patients in Africa was troublesome. From a study done in south Africa, in the years between 2007 and 2011, the prevalence of crude stroke mortality was 114 per 100,000 person-years (11). In addition, from an estimate 75,000 per year stroke case prevalence's, 25 000 of the patients died within the first month. In that study, stroke attributed for 564 000 Disabled Adjusted Life Years(DALY) (12).

The prevalence of type of stroke in Ethiopia varies between studies. In many studies ratio of ischemic stroke outweighs haemorrhagic stroke (13–16). In Ethiopia fatality rate of stroke patients was found to be 31.1% in one study. Besides, 45.4% of patients diagnosed with stroke discharged with neurological deficits (14). In Northwest Ethiopia, Gonder, 13% of the stroke patients died at the stroke unit with median of hospital stay being 6 days (9). Nevertheless, in the study area the trend of stroke mortality is not comprehensively and certainly known. Therefore, the main purpose of this study was to determine management outcome, mortality and factors associated with mortality amongst hospitalized patients with stroke.

## Methods

The study was conducted in Ayder Comprehensive Specialized Hospital (ACSH) which is found in Mekelle city, Tigray region, Ethiopia. ACSH provides a broad range of medical services to both inpatients and outpatients of all age groups. A hospital based cross-sectional study was conducted to run the study. Patient who were admitted to the ACSH since September 2013 to September 2018 were deployed for study selection. Patients who were diagnosed with all types of stroke, age of 18-years and older were included in the study. Patients medical registry and chart was the main source of data. Patients with incomplete medical registry and chart were excluded from the study.

Sample size was calculated with assumptions of confidence level at 95% CI, degree of precision at 0.05 and  $z=1.96$ . Taking prevalence of 15.1% mortality in to consideration and adding contingency of 10%, the calculated sample size was 216. patients who were admitted to medical and intensive care unit of the hospital were identified from the hospital management information system patient registration book. Moreover, patients chart stroke cases were identified through review of discharge logbooks from medical

and intensive care unit wards. Each patient's medical chart was assigned a number and patients were selected and included in the study using systematic random sampling technique.

Data collection tool which enables data collector to extract the data from patient's chart was used to collect patients' medical and sociodemographic information. The data collection tool was developed by reviewing reputable literatures and adopting patients medical record format in the hospital. The data collection tool was written in English. The main contents of the data collection tool entailed sociodemographic characteristics, medications given for patients, type of diagnosis, type of stroke, comorbidities, complications recorded, treatment outcome and Glasgow coma scale score. Data were collected by three pharmacy technicians who were employed out of ACSH. All the information's were retrospectively collected from patient's chart.

Data collectors have been trained prior to data collection process and procedure. In addition, to that the data collection tool was pretested in 10 stroke patients which were excluded from analysis. Based on the pretests findings, the data collection tool was amended. During data collection the principal investigator supervised closely the data. At the end of each data collection day the principal investigator was also checking the completeness and quality of the data.

Ethical clearance was obtained from the office of Health Research Ethics Review Committee of college of health sciences, Mekelle University. The study was conducted after getting official permission from the ACSH. To ensure confidentiality, the names of patients and address were not recorded.

## **Statistical Analysis**

Before data entry, data was cleaned and coded. After checking completeness and categorization of the data, it was entered in to SPSS version 21 software for analysis. Logistic regression was used to identify factors associated with mortality. Predictors of mortality were identified using multivariable logistic regression analysis. Level of significance was declared at p value less than 0.05 for all types of analysis.

## **Operational definitions**

**Stroke:** defined as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function lasting longer than 24 hours, unless interrupted by death, with no apparent cause other than that of vascular origin". By applying this definition transient ischemic attack, which is defined to last less than 24 hours, and patients with stroke symptoms caused by subdural hemorrhage, tumors, poisoning, or trauma, are excluded (17).

**Improvement:** Is when an individual stroke patient discharged with better health and relieved from clinical complaints in the admission as well as none of the complications developed.

**The same/no change:** Is when the treatment of signs and symptoms failed/no improvement and no complications developed.

**Death:** When loss of life occurs due to all causes of mortality after the patient has admitted to the hospital.

**Against medical advice:** Is when stroke patients refuse all the medical advices despite their health status and treatment outcomes.

## Results

### Sociodemographic and clinical characteristics

A total of 216 patients diagnosed with all types of stroke were recruited and analyzed. Amongst the patients studied, 126(58.3%) were females in gender. The mean age of the patients was  $61.2 \pm 15.6$  year ranging from minimum of 20 to 95 years. Concerning residence of the patients, when 115(53.2%) were from rural, the rest 101(46.8%) patients were urban residents. The median length of hospital stay of the patients were 8 days, whereas the median time from sign and symptom onset to hospital admission was 24 hours. Ischemic stroke was the most commonly diagnosed type of stroke, which was affirmed in (n=111), 51.4% of the patients followed by hemorrhagic stroke (n=96, 44.4%) (Table 1).

A total of 190 stroke patients had an evidence of comorbid medical illness. The commonest comorbidity diagnosed was hypertension, which was found in 150(65%) patients, followed by Atrial fibrillation (n=21, 9%) and then congestive heart failure (n=14, 6%), respectively (Figure 1).

Regarding to the recorded complications, about 136 patients had diagnosed with at least one complication during their hospital stay. A total of 234 complication records were identified in the total 216 stroke patients studied. Aspiration pneumonia (n=92, 39.4%) were the frequently identified complication. Increased intracranial pressure (ICP) (n=40, 17%) and cardiorespiratory failure (n=38, 16.2%) followed aspiration pneumonia (Figure 2).

### Outcome, mortality and mortality predictors

One hundred two (47.2%) patients discharged with improvement, 44(20.4%) patients left against medical advice, and 22(10.2%) patients discharged with no change. Moreover, 48(22.2%) patients died in the hospital. The median time to death was 3 days ranging from 1 to 48 days and the average mean time to death was  $6.2 \pm 8.7$  days. The factors that were associated with mortality were potassium level [COR=2.71, 95%CI: 1.22-6.03, P-value=0.015], level of consciousness [COR= 7.36, 95%CI; 3.62-14.96, P-value<0.001], GCS score at admission [COR=20.94, 95%CI; 7.57-57.94, P-value<0.001], time until hospital arrival [COR=5.66, 95%CI:1.82-17.61, P-value=0.003], COR=3.47, 95%CI:1.441-8.346, P-value =0.006], blood pressure control at admission [COR=0.38, 95% CI:0.17-0.86, P-value= 0.021] and hospital stay [COR=0.268, 95%CI: 0.090-0.797, P-value=0.018] (Table 2).

The mortality predictors of stroke patients in this study were, severe (3-8) record of Glasgow coma scale at admission (AOR=15.33, 95%CI:3.77-62.40, p=0.001) and being unconscious (AOR=2.61, 95%CI:1.06-6.40, p=0.037) during admission. Stroke patients who were with severe record of GCS (3-8) during admission were 15 times more likely to die than those patients who were with mild score of GCS (13-15). In addition to that, stroke patients who were unconscious at admission were more than two times more likely to die than those of conscious stroke patients at admission (Table 3).

## Discussions

In this study, an attempt had been made to assess the outcome of stroke patients after they have been hospitalized in ACSH. After the patients had admitted to hospital, 62.9% of the patients developed at least one stroke complication making the total frequency of complications to be 234. The most frequent complication identified was aspiration pneumonia with 39.4% of the frequencies, followed by ICP increment, which attributed for 17% of the total frequencies calculated. After medical and therapeutic treatments, 42.7% of the patients discharged with improvement. Nevertheless, when 20.4% of the patients left against medical advice, 10.2% of the patients have been discharged with no change. Moreover, 22.2% of the stroke patients died at the hospital. The median time to death was 3 days ranging from a minimum of 1 day to the maximum of 48 days. The average mean time to death was  $6.2 \pm 8.7$  days. Severe (3-8) score of GCS at admission and being unconscious at admission were the two predictors of mortality in the hospital.

More than 60% of the stroke patients in the hospital developed at least one and /or above type of complication. Aspiration pneumonia was the most frequent type of stroke complication detected in our study. From a study conducted in Addis Ababa, the prevalence of complications was 71.8% which was relatively higher than our finding. In this study aspiration pneumonia was the most frequent complication among the stroke patients which is similar to our finding (18). Moreover, in a study from Gonder aspiration pneumonia was also the commonest type of complication discovered in stroke patients (19). The number of patients in the study conducted in Addis Ababa were few in number and it was a prospective study design. The discrepancy between the two studies might be originated from that study design difference.

The mortality proportion in our hospital was 22.2%. This is relatively similar with a study conducted in Addis Ababa, which reported a prevalence of 23% (18). Locally from our country, a relatively lower mortality rate with, a mortality prevalence of 13% from Gonder, Northwest Ethiopia (19) and 15.1% from Shashemene (20), 16.2% in Ambo (21) were respectively reported. Moreover, in neighbor country Kenya a mortality prevalence of 5% has also been found (22). The difference might be due to difference in study setting. ACSH is a comprehensive specialized hospital. It serves for referred patients with exaggerated complications from the region and other peripheral areas of Afar region and Amhara region. Therefore, relatively patients in the hospital are not similar to those patients who served in the other regions hospitals. Besides, there is time delay between symptom onset and admission that could result in treatment delay predisposing to mortality which might be due to issue of transportation and lack of

symptom awareness of stroke. On the contrary, in a study conducted in Tikur Anbessa Hospital, capital of Ethiopia, 44.5% of the patients died at the hospital (13). Similarly, in a study from Gambia 41% of the stroke patients died at hospital (23). Our study setting is comprehensive specialized hospital which has Computed Tomography scan and Magnetic Resonance Imaging diagnosing materials. This might enable patients to easily confirm and detect stroke as fast as possible and intervene as quick as much.

Patients who were unconscious were more likely to die in hospital than stroke patients who were mentally alert. This finding concurred with the report of Tikur Anbessa hospital. In a study conducted in Addis Ababa, altered mental state were found an independent determinant of mortality. In that study, patients with alert mental state were less likely to die (13). When patients are unconscious they are imperatively at risk of infectious disease and other lethal complications. As far as they have swallowing problem, they will have risk of death. Swallowing difficulties and level of consciousness at admission were a predictor of fatal out come in stroke patients like our findings (23). Sever (3–8) score of GCS was also a predictor of mortality in our study. Many studies also found to be advocative of our report. Patients at who were with lowest score of GSC were at risk of stroke complications which ultimately precipitates patients death (23, 24).

The mean hospital stay of the patients on the wards was 9.91 days. In contrast to this, a higher hospital stay was reported from a study at university of Gondar hospital Ethiopia, and Nairobi hospital, Kenya, which found a mean length of hospital stay of stroke patient to be 13 days and 12.5 days respectively (19, 22). This difference might be due to difference in patient load and number of availability of beds. The median time from stroke symptoms onset to hospital admission was 24 hours in our setting which is similar to retrospective cross-sectional study in Shashemene with a median time from symptom onset to hospital admission of 23.3 hours (20). In contrary, a hospital-based multicenter prospective study in Brazil illustrated that the median time from symptoms onset to hospital admission was 12.9 hour (25). This disparity might be due to better infrastructure and greater awareness of people about the ways of management and risks of stroke in hospital admission in Brazil.

This study is the only study done in our hospital. It conceals relatively larger population. There is no immaculate study globally. Hence this study has also its own flaws. For instance, this is hospital based study and as such the results cannot be generalized to the general population. As this study is based on retrospective chart review, the data obtained might be affected by the documentation culture of the hospital and health care professional. Significant numbers of patients were discharged against medical advice which made the in hospital mortality non representative of the short term mortality. The study hasn't assessed the rate of disability and functional limitation; those were not documented in the patient chart record. Moreover, the management intervention done was not also studied.

## Conclusion

Significantly higher number of patients have been died at the hospital. The stay of the patients in the hospital was also longer. Majority of the patients had a diagnosis of, aspiration pneumonia being the

most frequent type of complication. Unconsciousness of patients at admission and patients with lower GSC scores were risk factors for stroke to be lethal. Strategies that could decrease mortality prevalence should be streamlined at the hospital setup level to improve stroke patients further better outcomes.

## Abbreviations

ACSH

Ayder Comprehensive Specialized Hospital

AOR

Adjusted Odds Ratio

BP

Blood Pressure

CHF

Congestive Heart Failure

CI

Confidence Interval

COR

Crude Odds Ratio

DM

Diabetes Mellitus

DVHD

Degenerative Valvular Heart Disease

DVT

Deep vein thrombosis

GCS

Glasgow Coma Scale

HTN

Hypertension, AF:Atrial Fibrillation

ICH

Intracranial haemorrhage

ICP

Intra-cranial pressure.

STEMI

ST-elevated Myocardial Infraction.

## Declarations

### **Ethics approval and consent to participate**

The study was approved by the Institutional Review Board of Collage of Health Sciences, Mekelle University. An informed written consent was obtained from all patients.

## Consent to publish

Not applicable.

## Availability of data and materials

The datasets supporting the conclusions of the study are included in the article. Any additional data will be available on request.

## Competing interests

The authors declare that they have no competing interests.

## Funding

The study was not supported by any funding agent.

## Authors' Contributions

All authors (SWA, KG, YLN, DMD, TMA) contributed toward data analysis, drafting and revising the paper and agree to be accountable for all aspects of the work.

## Acknowledgements

The authors are indebted to all participants of the study, data collectors, Ayder comprehensive specialized hospital staffs and Mekelle University.

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## Tables

**Table 1: Socio-demographic and clinical variables of stroke patients admitted to ACSH, during Sep2013 to Sep2018, Mekelle, Ethiopia. (N=216)**

Variable		N(%)
Sex	male	90(41.7)
	Female	126(58.3)
Age	20-39	19(8.8)
	40-59	58(26.9)
	60-79	109(50.5)
Region	≥ 80	30(13.9)
	Tigray	201(93.1)
	Afar	7(3.2)
Residence	Amhara	8(3.7)
	Urban	101(46.8)
Level of consciousness	Rular	115(53.2)
	Conscious	149(69)
BP at admission	Unconscious	67(31)
	Controlled BP	59(27.3)
Total cholesterol level	Uncontrolled BP	157(72.7)
	Normal cholesterol level	84(73.7)
Random blood sugar level	Abnormal cholesterol level	30(26.3)
	Controlled RBS	95(91.3)
serum creatinine level	Uncontrolled RBS	9(8.7)
	Normal scr level	150(85.2)
Potassium level	abnormal scr level	26(14.8)
	Normal K level	149(79.7)
Ejection fraction /echo	Abnrmal K level	38(20.3)
	Normal EF	53(88.3)
Glasgow Coma Scale	Abnormal EF	7(11.7)
	Sever (3-8)	47(21.8)
	Moderate (9-12)	85(39.4)
Type of stroke	Mild (13-15)	84(38.9)
	Ischemic stroke	111(51.4)
	Hemorrhagic stroke	96(44.4)
History of previous stroke	Cardio-embolic stroke	9(4.2)
	No(new stroke)	191(88.4)
	Yes old stroke	25(11.6)

**Continued from table 1**

Variable		N(%)
Time of hospital arrivals in hours	1-6	24(11.1)
	7-48	119(55.1)
	>48	73(33.8)
Comorbidity yes/no type	No comorbid	26(12)
	Yes with comorbidity	190(88)
Medication at admission	No medication	183(84.7)
	Yes	33(15.3)
Antihypertensive drugs used for treatment of stroke	No	78(36.1)
	Yes	138(63.9)
Lipid lowering agents used	No	102(47.2)

	Yes	114(52.8)
Antiplatelet or/and anticoagulant drugs used	No	102(47.2)
	Ye	114(52.8)
Prophylaxis for stress induced ulcer	No	23(10.6)
	Yes	193(89.4)
Asprin loading dose given	No	199(92.1)
	yes	17(7.9)
Prophylaxis for DVT	No	51(23.6)
	Yes	165(76.4)
UFH Loading dose given	No	208(96.3)
	Yes	8(3.7)
Hospital stay in day	1-10	150(69.4)
	11-20	45(20.8)
	≥ 21	21(9.7)

Ky notes: N:frequency, UFH :Unfractionated heparin, DVT: deep vein thrombosis

**Table 2: Logistic regression analysis of variables associated with mortality among patients with stroke in Ayder Comprehensive Specialized Hospital, 2019.**

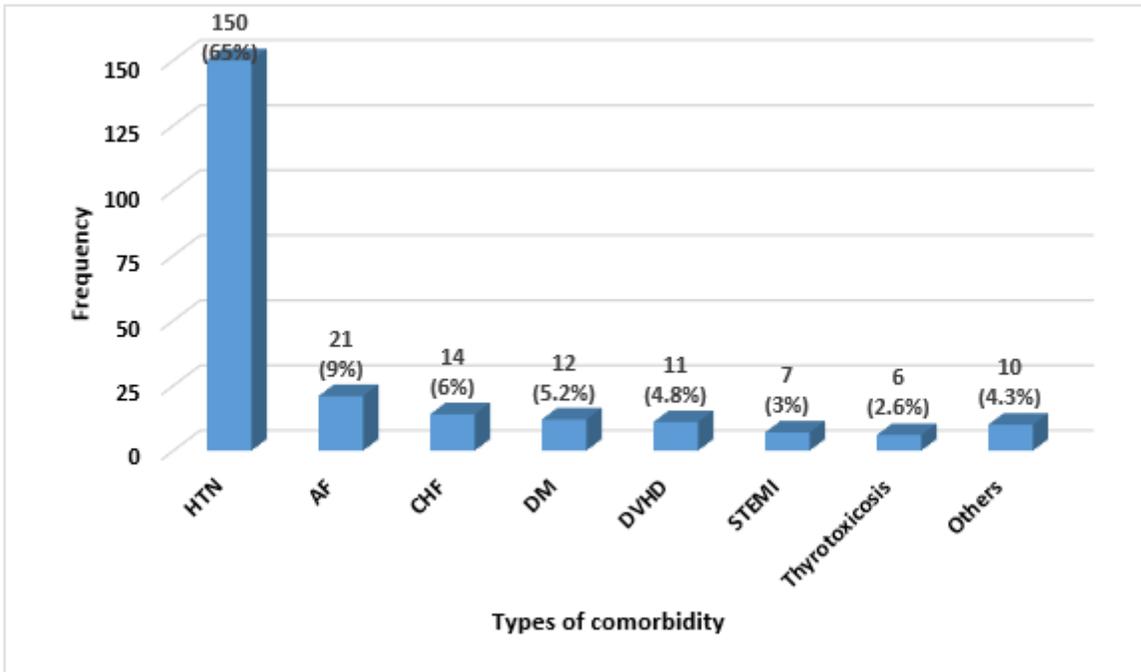
Variable		Number of patients		COR (95%CI),p - value
		Alive	Died	
Sex	Male	71(32.9)	19(8.8)	1
	Female	97(44.9)	29(13.4)	1.12(0.58-2.15)0.74
Age	20-39	18(8.3)	1(0.5)	1
	40-59	44(20.4)	14(6.5)	5.73(0.7-46.84),0.10
	60-79	84(38.9)	25(11.6)	5.36(0.68-42.14),0.111
	≥ 80	22(10.2)	8(3.7)	6.55(0.75-57.34)0.09
Region	Tigray	155(71.8)	46(21.3)	1
	Afar	6(2.8)	1(0.5)	0.56(0.07-4.79),0.60
	Amhara	7(3.2)	1(0.5)	0.48(0.06-4.01),0.50
Residence	Urban	77(35.6)	24(11.1)	1
	Rural	91(42.1)	24(11.1)	0.85(0.45-1.61),0.61
Level of consciousness	Conscious	133(61.6)	16(7.4)	1
	Unconscious	35(16.2)	32(14.8)	<b>7.36(3.62-14.96),0.000</b>
BP at admission	Controlled	58(26.9)	8(3.7)	<b>0.38(0.17-0.86),0.021</b>
	Uncontrolled	110(50.9)	40(18.5)	1
Total cholesterol level	Normal	74(64.9)	10(8.8)	1
	Abnormal	25(21.9)	5(4.4)	1.48(0.46-4.75),0.510
Random blood sugar level	Controlled	72(69.2)	23(22.1)	1
	Uncontrolled	7(6.7)	2(1.9)	0.90(0.17-4.61),0.894
Serum creatinine level	Normal	125(71.0)	25(14.2)	1
	Abnormal	20(11.4)	6(3.4)	0.15(0.55-4.11),0.431
Potassium level	Normal	124(68.5)	24(13.3)	1
	Abnormal	21(11.6)	12(6.6)	<b>2.71(1.22-6.03),0.015</b>
Ejection fraction /echo	Normal	50(83.3)	3(5.0)	1
	Abnormal	5(8.3)	2(3.3)	6.67(0.89-49.83),0.065
Glasgow Coma Scale	Sever (3-8)	18(8.3)	29(13.4)	<b>20.94(7.57-57.94),0.000</b>
	Moderate (9-12)	72(33.3)	13(6.0)	2.35(0.85-6.50),0.101
	Mild (13-15)	78(36.1)	6(2.8)	1

Type of stroke	Ischemic	88(40.7)	23(10.6)	1
	Haemorrhagic	74(34.3)	22(10.2)	1.14(0.59-2.20),0.703
	Cardio-embolic	6(2.8)	3(1.4)	1.91(0.44-8.24),0.384
History of previous stroke	New stroke	148(68.5)	43(19.9)	1
	Old stroke	20(9.3)	5(2.3)	0.86(0.31-2.43),0.776
Time of hospital arrivals in hours	1-6	15(6.9)	9(4.2)	<b>5.66(1.82-17.61),0.003</b>
	7-48	87(40.3)	32(14.8)	<b>3.47(1.44-8.35),0.006</b>
	>48	66(30.6)	7(3.2)	1
Comorbidity	No	21(9.7)	5(2.3)	0.81(0.29-2.29),0.696
	Yes	147(68.1)	43(19.9)	1
Medication at admission	No	143(66.2)	40(18.5)	1
	Yes	25(11.6)	8(3.7)	1.14(0.48-2.73),0.762
Antihypertensive drugs for stroke treatment	No	64(29.6)	14(6.5)	0.67(0.33-1.34),0.258
	Yes	104(48.1)	34(15.7)	1
lipid lowering agents for stroke treatment	No	77(35.6)	25(11.6)	1.28(0.68-2.44),0.445
	Yes	91(42.1)	23(10.6)	1
Anti-platelet or/and anticoagulants drugs	No	77(35.6)	25(11.6)	1.29(0.68-2.44),0.445
	Yes	91(42.1)	23(10.6)	1
Prophylaxis for stress induced ulcer	No	18(8.3)	5(2.3)	0.97(0.34-2.76),0.953
	Yes	150(69.4)	43(19.9)	1
Aspirin loading dose given	No	153(70.8)	46(21.3)	1
	Yes	15(6.9)	2(0.9)	0.44(0.098-2.01),0.292
Prophylaxis for DVT	No	35(16.2)	16(7.4)	1.90(0.94-3.85),0.075
	Yes	133(61.6)	32(14.8)	1
UFH Loading dose given	No	163(75.5)	45(20.8)	1
	Yes	5(2.3)	3(1.4)	2.17(0.5-9.44),0.300
Hospital stay in days	1-10	110(50.9)	40(18.5)	1
	11-20	41(19.0)	4(1.9)	<b>0.27(0.09-0.79),0.018</b>
	≥ 21	17(7.9)	4(1.9)	0.65(0.21-2.04),0.457

**Table 3: Multivariable logistic regression analysis of variables associated with mortality among patients diagnosed with stroke in Ayder Comprehensive Specialized Hospital, 2019.**

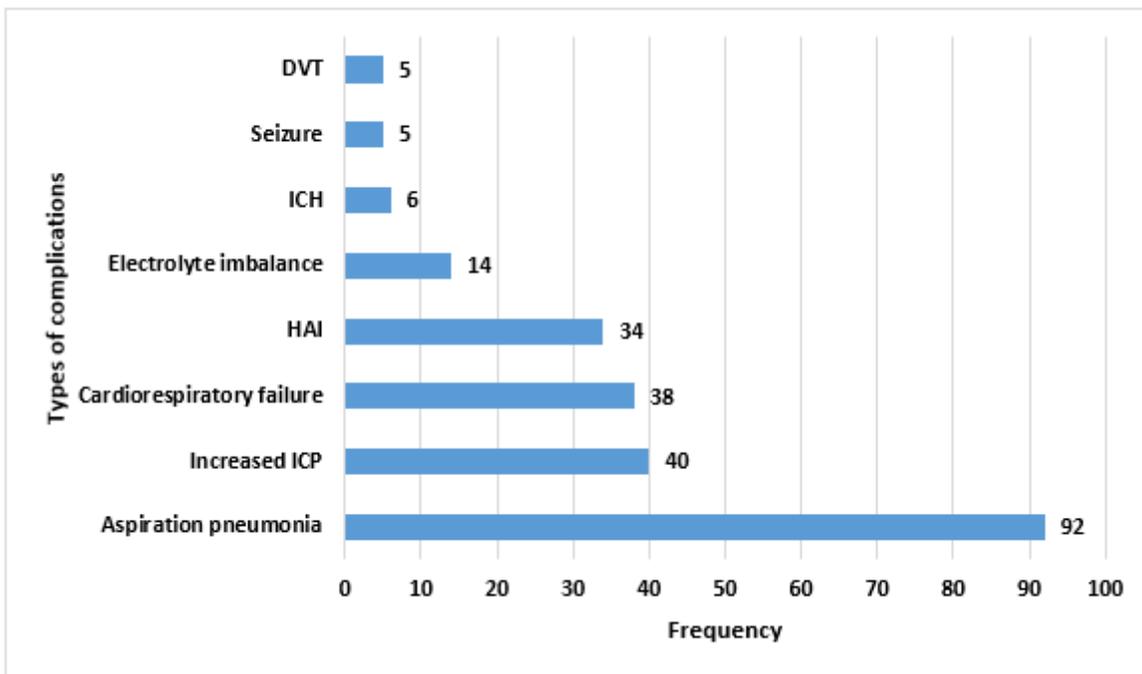
Variable		Mortality		AOR (95%CI),p - value
		Alive	Died	
Level of consciousness	Conscious	133(61.6)	16(7.4)	1
	Unconscious	35(16.2)	32(14.8)	<b>2.61(1.10-6.40), 0.037</b>
BP at admission	Controlled	58(26.9)	8(3.7)	1.60(0.57-4.52), 0.38
	Uncontrolled	110(50.9)	40(18.5)	1
Potassium level	Normal	124(68.5)	24(13.3)	1
	Abnormal	21(11.6)	12(6.6)	1.91(0.71- 5.13), 0.20
Glasgow Coma Scale	Sever (3-8)	18(8.3)	29(13.4)	<b>15.33(3.77-62.40), 0.001</b>
	Moderate (9-12)	72(33.3)	13(6.0)	3.22(0.85-12.18), 0.085
	Mild (13-15)	78(36.1)	6(2.8)	1
Time of hospital arrivals in hours	1-6	15(6.9)	9(4.2)	3.49(0.73-16.14), 0.11
	7-48	87(40.3)	32(14.8)	1.83(0.65-5.20), 0.26
	>48	66(30.6)	7(3.2)	1
Hospital stay in days	1-10	110(50.9)	40(18.5)	1
	11-20	41(19.0)	4(1.9)	0.40(0.12-1.39), 0.15
	≥ 21	17(7.9)	4(1.9)	0.46(0.11-1.92), 0.29

## Figures



**Figure 1**

Frequency of comorbidities among patients diagnosed with stroke in Ayder Comprehensive Specialized Hospital, 2019. Key notes: HTN: Hypertension, AF: Atrial Fibrillation, CHF: Congestive Heart Failure, DM: Diabetes Mellitus, DVHD: Degenerative Valvular Heart Disease, STEMI: ST-elevated Myocardial Infraction.



**Figure 2**

Types and frequency of complications among patients diagnosed with stroke in Ayder Comprehensive Specialized Hospital, 2019. Keynote: DVT: Deep vein thrombosis, ICH: Intra-

cranial pressure.

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [STROBEchecklist.docx](#)