Clinical profile, in-hospital outcome and associated factors of stroke after the start of a standard organized stroke care unit at university of Gondar hospital, northwest Ethiopia.

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Abstract

Background: Stroke is the leading public health problem globally. Stroke management largely depends on non-drug interventions. Stroke care units are facilities in hospitals that showed patients increased survival, return home, and regain independence in daily activities. This study was aimed to assess clinical profile, in-hospital outcome and its associated factors of stroke after the start of a standard organized stroke care unit in the study area. **Method:** Hospital based cross sectional study was conducted from July 2015 to September 2017. A total of 151 stroke patients with computed tomography (CT) scan result were included in the study. Data was collected using standardized questionnaire from secondary sources like patients medical records. Binary logistic regression were fitted to identify predictor variables. Adjusted Odds ratio(OR) with 95% confidence interval was computed and variables with p-value less than 0.05 in the multi-variable regression model considered as significantly associated with the dependent variables. **Result:** Ischemic stroke (60.3%) subtype was the most common. The median age at presentation was 65 (IQR: 55-75) years. Hypertension (49.7%) and carotid atherosclerosis (54.7%) were the most commonly identified risk factors. Overall In-hospital mortality was 9.3% (95% CI: 5.2%-15.1%), poor disability outcome at discharge was 55.6% (95%CI: 47.3%-63.7%), and median length of hospital stay was 10 (IQR: 7-14) days. Being male (AOR=0.19, 95%CI: 0.038 0.97), longer in-hospital stays (AOR=0.21, 95%CI: 0.048 0.93) were significant predictors of in-hospital mortality. Furthermore increased ICP (AOR=2.81, 95%CI: 1.22 6.92) was also the predictor of poor disability outcome at discharge. **Conclusion:** In-hospital mortality was lower than previous studies. However post-discharge disability is higher. Male sex, length of in-hospital stay, was significant predictors of in-hospital mortality. Increased intracranial pressure was also significant predictor of poor disability outcome at discharge. **Key words:** In hospital outcome, Mortality, poor outcome, stroke care unit, Gondar

Background

The epidemics of non-communicable diseases results a devastating health consequences [1]. Cardiovascular diseases are the leading causes of disability and death globally [1-3]. Stroke is caused by the interruption of blood supply to the brain because of blood vessels bursts or blockage which is characterized by neurological deficits[4]. Worldwide Stroke is the second leading cause of death and third leading cause of disability[2]. Globally, majority of stroke related mortality and disabilities occur in low- and middle-income countries [1, 2, 5].

Despite significant reduction of stroke incidence in developed countries, in the last four decades stroke incidence also doubled in developing countries[3, 6]. Ischemic stroke is the most prevalent and hemorrhagic stroke is the most fatal stroke subtype[7]. African countries faced double burden from infectious and NCD like stroke. Epidemiological transitions and widespread of risk factors made stroke the common health problem in sub-Saharan countries in the early age[2].

Stroke management largely relied on treatment of complications and supportive care in health facilities. Stroke managed in different health facilities like hospital general wards, intensive care units, and stroke

care units. Stroke care units show proven effectiveness in improving stroke outcome like increasing patient's survival, return home, and regain independence in daily activities [8, 12-14]. Evidences from previous studies, stroke management in stroke care units decreased mortality by 25% compared to general hospitals[10, 11].

Organized stroke care units are facilities in which stroke care services provided in hospital by team of health care workers like nurses, doctors, and therapists who specialize in monitoring stroke patients. Since July 2013 Gondar University hospital with collaboration of Southampton University established organized stroke care unit. Trained nurses and neurologists regularly follow the progress of patients. Stroke care unit was new not only in the hospital but also in the country. No study was conducted after the start of organized stroke care unit in the study area.

Therefore, this study was aimed to assess clinical profile, in-hospital outcomes and associated factors of stroke after the start of standard organized stroke care unit at university of Gondar hospital. This research could help to evaluate the impacts of stroke care unit at hospital level and be used to inform respective stakeholders for strengthening and establishment isolated stroke care unit in university of Gondar and other hospitals.

Methods

Study setting

The study was conducted at the University of Gondar Hospital, which is the only comprehensive specialized hospital in Gondar City, the Amhara National Regional State, Ethiopia. More than 450, 000 people visit the hospital every year for different health care services. The hospital also serves as a referral center for a population of more than five million people in the surrounding catchment area which has varying climatic and geographical distributions. Standard stroke care unit established at university of Gondar comprehensives specialized hospital in 2013 with collaboration of Southampton University. The stroke care unit has 4 beds with trained professionals.

Population and sample

A hospital based cross sectional design was used from July 1 2015 to September 20 2017. All stroke patients who have been admitted and had treatment follow up in university of Gondar hospital internal medicine ward stroke care compartment were selected as study participants. All admitted patients with clinical and imaging diagnosis of new onset of stroke and admitted to stroke care unit within 7days of diagnosis were inclusion criteria. Those patients with incomplete data for major variables like in hospital outcomes were excluded. A total of 151 patients who fulfilled the inclusion criteria was included in the study.

Data collection and variables

Data were collected by internal medicine residents using a checklist sheet from the medical records of those patients who had been admitted to stroke care unit with a diagnosis of stroke during data collection period. In hospital outcomes (mortality and poor disability outcome at discharge) were response variables. The checklist contained socio-demographic data, HIV status, and type of stroke, common risk factors (hypertension, diabetes mellitus, substance use, neurologic risk factors and atrial fibrillation) and possible treatment outcomes of patient. Poor disability outcome at discharge: when a patient had Modified Rankin score (MRS) greater than or equals to 3 at discharge. Longer in-hospital stay: patients who stay admitted in hospitals for more than 10 days.

Data management and analysis

Collected data was checked for consistency, cleaned, coded and entered to EPI info 2007 and then exported to SPSS version 22 for further analysis. Descriptive measures summarized by using frequency tables and graphs. Binary logistic regression was fitted to identify predictor variables. An adjusted odds ratio (OR) with 95% confidence interval computed and variables who had p-value less than 0.05 in the multi-variable model as significantly associated with the dependent variables.

Results

Socio demographic characteristics

A total of 151 patients were included in the study. Nearly half (50.3%) of patients were females and majority (63.7%) of patients were rural dwellers. The median age at the presentation was 65 (IQR: 55-75) years old. Stroke in the young age group (less than 40 years) accounted for 6.6% of cases (Table 1).

Risk factors and co-morbidities

Hypertension was found to be the most common antecedent risk factor in 76 (50.3%) patients. History of antecedent hypertension was identified in 44.7% and 55.3% of patients with hemorrhagic and ischemic strokes respectively. Diabetes mellitus (DM) was identified as a risk factor in 13 (8.6%) patients and 9 (11.8%) patients had both hypertension and diabetes mellitus. Among patients with antecedent hypertension, nearly two third (65.3%) of patients were on regular medication. For 84 (55.6%) of patients carotid Doppler ultrasound was done and atherosclerotic changes were reported in 46 (54.7%) patients (Table 2).

Clinical presentations of stroke

Among total patients 88(58.3%) patients were admitted to hospitals within 24 hours after onset of stroke. The commonest complaint was failure to use hemi-body followed by altered mentation. Twenty-eight(18.5%) of patients were having admission fever greater than 38°C and RBS $\geq$ 200 mg/dl was recorded in 11(8%) of patients at admission (Table 3).

Stroke sub types

The most common stroke subtype was ischemic stroke 90 (60.3%) cases, while hemorrhagic stroke accounted for 60(39.7%) of cases. The median age for ischemic and hemorrhagic stroke was 61.5 (IQR: 55-70) and 60(IQR: 60-75) years respectively. There was no statistically significant difference between two stroke subtypes with sex, area of residence, and preceding history of hypertension. Among ischemic stroke cases majority (76.6%) of them had affected anterior vessel circulation territory followed by more than two areas (12%) and Lacunars (7.8%). Regarding anatomy location of hemorrhagic stroke Basal ganglia (52.2%), Lobar (22.6%), and thalamic (19.3%) were the most common findings.

Complications

Sixty four (42.8%) had one or more complications, commonest complication was increased ICP found in 50(33.1%) followed by aspiration which was detected up on physical examination in 45(29.8%) of patients. About 10 (6.6%) patients developed hospital acquired pneumonia and one patient was diagnosed with DVT.

In-hospital outcome of stroke patients admitted to stroke care unit

The overall in hospital mortality was 14 (9.3%) with (95% CI: 5.2%-15.1%) and compared to stroke sub types the in-hospital mortality was equal between hemorrhagic and ischemic stroke. The median length of hospital stay was 10 (IQR: 7-14) days. Patients discharged to stroke care estimated the degree of disability based on several factors mentioned in the patients' charts. Based on classified disability degree estimated MRS scale as good and poor outcome, 84(55.6%) with (95%CI: 47.3% 63.7%) patients had poor disability outcome at discharge (MRS 3-6). There is no significant difference between stroke sub-units with disability degree at discharge ($p=0.22$).

Factors associated with in-hospital outcome of stroke

Finding from bivariate logistic regression: incontinence, sex, and evidence of increased intracranial pressure, level of consciousness, admission swallow test, and length of in-hospital stay, and aspiration pneumonia were statistically significant at a p value of 0.2.

In the multivariable logistic regression: incontinence, length of hospital stay, and sex of stroke patient were significant predictors of in hospital mortality. In addition this evidence of increased intracranial

pressure were significantly associated with poor disability outcome at multivariable logistic regression model.

Male stroke patients were 81% less likely to have in hospital mortality outcome compared to female stroke patients (AOR=0.19, 95%CI: 0.038 0.970). Stroke patients who had longer than 10days in-hospital stay were 79% (AOR=0.21, 95% CI: 0.048 0.93) less likely to have in-hospital mortality compared to those who had shorter length of hospital stay.

Regarding to poor hospital outcome; patients with evidence of increased intracranial pressure 3.18(AOR=3.18, 95%CI: 1.43 7.05) time more likely to have poor in hospital outcome as compared to those not have ICP (Table 4).

Discussion

The most common stroke subtype was ischemic stroke (60.3%) cases while the remaining accounted for hemorrhagic stroke. The median age of patients with ischemic stroke was 65.5 years (IQR: 60.5-78) and compared to 59.4 years (IQR: 55-70) for hemorrhagic stroke. Compared to previous study that was done in the same setup and study done in southern Ethiopia the proportion of hemorrhagic stroke was found to be higher in our study[15, 16]. But the proportion is comparable with other studies done in SSA[17, 18]. Hypertension was found in half of our patients with similar proportion between stroke subtypes. Atrial fibrillation was found in 29(37.6%) of ischemic stroke patients who had ECG reading. Cardiac abnormalities were found in 63 (80.7%) of ischemic stroke patients who had Echocardiography, DVHD being the commonest. Only 3 patients had CRVHD and all of them were having ischemic stroke.

The overall in-hospital stroke mortality in this study was 9.3%. The mortality of ischemic stroke (7.7%) whereas that of hemorrhagic stroke was (11.7%). The overall in-hospital stroke mortality in this study was higher than that of high income countries like Germany (5.4%)[19], United States of America (6%)[20], and China (2.30%)[21]. This may be explained by difference in health seeking behavior, lack of early interventions, and stroke care unit setup differences. But, this study finding was lower than that reported from SSA; in-hospital stroke mortality of 19.8% to 44% had been reported in other African hospital based studies[15, 18]. Compared to the previous study done in similar setup before establishment of stroke care unit mortality seems lower (9.3 vs. 13.3%). This might be explained by management of cases of stroke through organized stroke care unit and sample size difference.

The commonest cause of death was increased ICP (50%) followed by sepsis (26.6%). Half of the total death happened in the first 7 days, increased ICP being the commonest cause. Sepsis and increased ICP contributed equally for deaths occurred after 7 days of hospital stay. The median duration of hospital stay was 10 (IQR: 7 -14) days. Regarding post stroke disability, about half (55.6%) patients were discharged with severe disability (Poor outcome MRS score $\geq$ 3). This is higher than study conducted in Germany[19]. This reflects limited rehabilitation services in our hospital which is the case for most low-income countries. More over in our setup stroke patients are regularly followed by nurses and neurologists but physical therapists rarely follow them.

The main predictors of in-hospital stroke mortality in this study; male sex, and length of hospital stay. Male patients were less likely to die compared to female patients. This finding supported by previous studies reasons might be age difference, atypical presentations[22]. Patients with longer in-hospital stay stroke mortality was 79% less likely compared to those who shorter LOS. This may be explained by early death from acute stroke complication such as Increased ICP and absence of clear admission and discharge criteria. The main predictors of poor outcome was evidence of increased ICP. Patients who have increased ICP were three times more likely to have poor in-hospital outcome as compared to those without features of increased ICP.

This study was limited by inadequate sample size which affects the power of study. In addition, our stroke care unit is not separate. In addition, patient discharge against medical advice was also a key barrier affecting optimal clinical care. Key skills for stroke care, such as speech and language therapy for dysphagia assessment, are not available. Limited staff especially stroke specialists (e.g., neurologists, neurosurgeons and trained stroke nurses) can also contribute.

Conclusion

Ischemic stroke was the most common stroke sub type. In-hospital mortality was lower than previous study findings, however more than half of patients had poor disability outcome according to MRS at discharge. Longer in-hospital stay and male sex were negatively associated with stroke mortality at stroke unit. Besides to this; evidence of increased intracranial pressure was associated with poor disability outcome at discharge.

Declaration

Ethical approval and consent to participate

The study was based on secondary data from medical records of stroke patients. Ethical clearance was obtained from institutional ethical review board of school of medicine, college of medicine and health science, University of Gondar. Waiver letter obtained from University of Gondar comprehensive specialized hospital administration. Checklists was kept secured locked in cabinets, databases and the database was password protected.

Consent for publication

Not applicable

Availability of data and materials

Data is available and it can be accessed from the corresponding author when asked with reasonable inquiry.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

SGA, NBG, ESG, and KST participated to design the study, data collection, performed data analysis, visualization, validation the whole work and prepared the manuscript. SGA took part in funding acquisition, data collection, supervision and software and other resources. All authors read and approved the final manuscript.

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Abbreviations

CRVHD: Chronic Rheumatic Valvular Heart Disease, DALY: Disability Adjusted Life's of Year, DVHD: Degenerative Valvular Heart Disease, VT: Deep Venous Thrombosis, ECG: Electro Cardiogram, ICH: Intra Cranial Hemorrhage, ICP: Intra Cranial Pressure, IQR: Inter Quartile Range, IRB: Institutional Review Board, LMIC: Low and Middle Income Country, LOS: Length of Hospital Stay, MRS: Modified Rankin Score, NCD: Non Communicable Disease, OR: Odds Ratio, TIA: Transient Ischemic Attack.

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Tables

Table 1: Socio demographic characteristics of stroke patients admitted to stroke care unit at university of Gondar comprehensive specialized hospital,2017 (n=151)

Characteristics	Frequency	Percentage
Gender		
Male	75	49.7
Female	76	50.3
Age		
20-39	10	6.6
40-64	59	39.1
≥65	82	54.3
Religion		
Muslim	17	11.3
Orthodox Christian	134	88.7
Residence		
Urban	53	35.1
Rural	98	64.9

Table 2: Socio-demographic characteristics of stroke patients admitted at university of Gondar comprehensive specialized hospital stroke care unit, 2017 (n=151)

Risk factors	Frequency	Percentage (%)
Hypertension	76	50.3
Diabetes mellites	13	8.6
Previous stroke or TIA	23	15.2
Structural heart disease	74	49
Smoking	2	1.3
More than moderate alcohol	15	10.6
HIV positive	4	2.6
Carotid atherosclerotic change	46	54.7
Atrial fibrillation	33	28.7

Table 3: Clinical presentations of stroke patients admitted at university of Gondar comprehensive specialized hospital stroke care unit, 2017 (n=151).

Characteristics	Frequency	Percentage (%)
Hemi paresis/hemiplegic	112	80.8
Failure to communicate	57	37.7
Dysphasia	30	19.9
Incontinence	65	43
Failed admission swallow test	76	50.3
Headache	58	38.4
Fever ≥ 38	28	18.5
Vomiting	40	26.5
Seizure	15	10
Altered mentions	69	45.7

Table 4 : Multivariable logistic regression analysis of predictors of in hospital outcome of stroke patients admitted at stroke care unit of Gondar university comprehensive specialized hospital.

Characteristics	In hospital mortality	Adjusted OR	Poor outcome	Adjusted OR		
	Yes	No		Yes	No	
Aspiration pneumonia						
Yes	8	37	2.14(0.45 10.21)	32	13	1.12(0.45 2.76)
No	6	100	1	52	54	1
Admission swallow test						
Passed	2	75	0.12(0.01 1.01)	32	45	0.49(0.21 1.11)
Failed	12	62	1	52	22	1
Any incontinence						
Yes	12	53	5.57 (0.98 31.42)	45	20	1.67(0.76 3.68)
No	2	84	1	39	47	1
Mentation						
Intact	3	79	0.95(0.14 6.69)	37	45	0.64(0.28 1.46)
Altered	11	58	1	47	22	1
Evidence of increased ICP						
Yes	7	43	2.53(0.49 13.0)	37	13	3.18(1.43 7.05)*
No	7	94	1	47	54	1
Sex						
Male	3	72	0.19(0.038 0.97)*	40	32	
Female	11	65	1	44	35	0.81(0.39 1.68)
Length of hospital stay						
≤ 10 days	11	75	1	42	44	1
>10 days	3	62	0.21(0.048 0.93)*	42	23	1.62(0.78 3.36)

* shows statistically significant association at a p-value <0.05