Management practice, and treatment outcome and its associated factors among hospitalized stroke patient at Ambo University Referral Hospital, Ethiopia: an Institutional Based Cross Sectional Study

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Abstract

Background: Although stroke has been consistently reported as one of the three leading causes of morbidity and mortality in the past few years in Ethiopia, there is a paucity of data regarding to stroke treatment outcomes and associated factors. Hence, this study was aimed to assess management practice, and treatment outcome and its associated factors among hospitalized stroke patients. **Method** an institutional based cross sectional study was conducted among 111 hospitalized stroke patients in the medical ward of Ambo University Referral Hospital(AURH), who had been hospitalized for the last three years (March 30/2016- May30/2019). All patients diagnosed with stroke and hospitalized in the medical ward of AURH were included in the study. Data were analyzed with SPSS version 25.0 statistical software. Bivariate and multivariate binary logistic regression analysis was conducted to identify the predictors of poor treatment outcome. **Result** The present study showed that ischemic stroke was the most prevalent (80.1%) form of stroke diagnosed in the study setting. Nonetheless, 18.2% of patients were diagnosed with hemorrhagic stroke. Among 111 study participants, 69 (62.2%) patients had good treatment outcome. From 42(37.8%) study participants with poor treatment outcome, 18(42.8%) were dead and 12 (28.6%) were with disability and left against medical advice on self and family request while the remaining 12 (28.6%) were referred to other higher health facility. Social history (substance abuse $P=0.046$, $AOR=2.684$, $95\%CI\ 1.091-6.604$), age ($P=0.026$, $AOR= 3.256$, $95\%CI = 1.145-9.260$) and chief complaint ($P=0.009$, $AOR=0.254$, $95\%CI=0.091-0.708$) were the predictors of treatment outcome among hospitalized stroke patients. Other variables like types of stroke, co-morbidity, and others did not show significant association with treatment outcome. **Conclusion** The present study showed that ischemic stroke was the most predominantly diagnosed type of stroke in our setting. Acetyl salicylic acid and ACE inhibitor based regimens were frequently used in the management of stroke and hypertension, respectively. Nearly one third of the study participants had good treatment outcome. Nonetheless, death was reported in 16.2% of hospitalized stroke patients in the study setting. Being older and substance abusers, and the presence of hemiparesis during the initial hospital admission were significant predictors of poor treatment outcome.

Background

According to World Health Organization (WHO), stroke is defined as a rapidly developing signs of focal or global disturbance of cerebral function with symptoms lasting for 24 hours or longer, or leading to death with no apparent cause other than vascular origin (1). In western countries, it is the third most common cause of morbidity and mortality (2). Despite 35% reduction in stroke mortality between 2001 and 2011, stroke occurs in the United States at a rate of almost 800,000 per year and resulted in 128,932 deaths in 2011 (3). According to Centers for Disease Control and Prevention report, the prevalence of stroke-related symptoms was found to be relatively high in a general population free of a prior diagnosis of stroke (4). According to American Heart Association report, stroke can be generally classified into either ischemic (87%) or hemorrhagic (13%) type. Ischemic type of stroke is significantly less lethal than hemorrhagic type of stroke, with 30-day case-fatality rates of 46.5% hemorrhagic stroke compared to 9% to 23% in

ischemic stroke (5). Recent community surveys undertaken in African countries showed stroke prevalence were between 200 and 300 per 100,000 populations (6). Although these figures are lower when compared to reports from developed countries (600–1000 per 100,000), they are significantly higher than previous reports of stroke prevalence in African countries (58–68 per 100,000) (7). Although stroke is currently observed to be one of the commonest reasons of admission in many Ethiopian hospitals, its prevalence in the community is not known due to the paucity of studies. Nonetheless, as per the WHO stroke mortality report, stroke mortality was estimated to be 122 and 153.8 per 100,000 for males and females, respectively in Ethiopia (8–10). As patients usually present late and the standard of care is poor as compared to developed countries, the mortality rate among hospitalized stroke patients is expected to be higher. Most of the information regarding stroke mortality and its determinants that we use in the management of stroke comes from studies in developed countries. Therefore, it is imperative that a lot has to be done to address the issues concerning the burden of stroke, risk factors and its mortality in Ethiopia. Hence, the purpose of this study was aimed to assess management practice, and treatment outcome and factors associated with poor treatment outcome in hospitalized stroke patients at Ambo University Referral Hospital (AURH).

Methods

Study design and period

An institutional based cross-sectional study design was conducted among patients with stroke who were hospitalized to the medical ward from 30th March 2016 to 30th May 2019 at AURH. The hospital is located in Ambo town, which is 114 km away from the capital city of Ethiopia, Addis Ababa. The hospital serves as a referral hospital for a catchment area of more than 2.5 million people and as teaching hospital. It also provides internal medicine, pediatrics, family planning, maternity, gynecologic/obstetric, surgery, emergency, ambulatory clinic TB and HIV services to the people of western Ethiopia. The data were collected from June 1 to 30, 2019.

Populations

Medical records of stroke patients in AURH who were admitted at the medical ward in the last three years from 30th March 2016 –30th May 2019 were included.

Eligibility criteria

All the medical records of hospitalized stroke patients admitted in medical ward of the hospital and older than 18 years and above were included in the study while stroke patients with incomplete medical records (i.e. incomplete treatment regimen and the status of the patients after treatment) were excluded in the study.

Sample size and sampling technique

One hundred eleven (111) stroke patients were selected by using convenience sampling technique as per inclusion criteria during the study period and analyzed in the present study.

Data collection and instrument

Data abstraction format were adapted from various literatures and further modified after pretest conducted in 5% of hospitalized stroke patient medical cards in AURH. The format was employed by reviewing patients' medical records to collect socio-demographic characteristics, clinical related information's, previous and current medications used for stroke and its co-morbidities, complications status, length of hospital stay, type of stroke, and treatment outcome status. Four clinical pharmacists were participated in the data collection.

Data quality assurance

The data collection instrument was assessed by a physician and an expert in the field of neurology for clarity and comprehensiveness of contents. Pilot study was employed on 5% of randomly selected medical records of stroke patients and all the necessary modifications were included in the final data collection instrument. The collected data were checked for completeness and consistency on daily basis throughout the data collection process by the principal investigator. Maximum effort was taken in order to maintain quality of data throughout the different steps such as data entry, analysis, interpretation and representation.

Data analysis

The collected data were entered and analyzed by using SPSS version 25.0 statistical software. Descriptive statistics were used to describe the percentage and frequency, mean of variables in the study. Binary and multivariate logistic regression analysis was conducted to identify factors associated with treatment outcome. A p-value of <0.05 was considered statistically significant.

Ethical Consideration

The research project was approved by the Ethical Review Board of Ambo University, College of Medicine and Health Sciences. The study was conducted after ethical clearance obtained from the board and after permission from the hospital management to review medical records of the patients. To ensure confidentiality of the patients' information, the name and address of the patients were not recorded during the data collection.

Operational Definition

Undetermined type of stroke: A type of stroke neither ischemic nor hemorrhagic, not clearly identified.

Improved or good outcome: If the patient is discharged without complication or if patient discharge with improvement.

Poor outcome: If the patient is discharged with complication, or referred to higher health facility or death.

Results

Socio demographic characteristics of patients

Among 111 study participants, females were accounted for 50.5 % (56). Mean age of the study participants was 63.36 ± 12.60 , with the age range of 23 - 92 years. Based on the patient's life style, 37 (33.3%) were substance abusers and the remaining had no history of substance abuse. Occupationally, majority of the study participants (44, 39.6%) were farmers followed by housewives (43, 38.7%) (Table 1).

Clinical Characteristics and co-morbid conditions of hospitalized stroke patients

The mean time of hospital arrival was 58.12 hours. About 69 (62.2%) of stroke patients were arrived in the hospital after 48 hours of symptoms onset while only 0.9% arrived before three hours of the onset symptoms. Eighty-five (76.6%) of stroke patients complained hemi-paresis (Table 2). Majority of the study participants (89, 80.2%) suffered from ischemic stroke while 18% (20) were suffered from hemorrhagic type of stroke (Figure 1).

Ninety-four (84.7%) patients had co-morbid conditions in which hypertension (49, 52.1%) accounted the highest percentage in all stroke types and predominantly common in hemorrhagic type (85%) than an ischemic type of stroke (45%). Atrial fibrillation was accounted for 23.4% of all stroke types from which it was more predominated in an ischemic type of stroke (20, 27.0%) rather than hemorrhagic type (2, 10.5%). The present study showed that aspiration pneumonia was the predominant (24, 85.7%) types of complications among stroke patients. The mean duration of hospital stay was 6.02 ± 3.24 days and more than half of patients (70, 63.1%) had <5 days of hospital stay (Table 2).

Past medication history of the study participants (N = 94)

The combination of ACEI with Beta-blockers was used in 44.6% of the study participants while ACEI with diuretics was employed in 24.6% of the patients. The most common oral hypoglycemic agent used was

metformin in 8.5% of the study participants (Table 3).

Medications used in hospital by study participants (N = 111)

Regarding medications used during hospitalization, 80 (89.9%) of study participants with ischemic type of stroke were prescribed Acetyl salicylic acid (ASA) with statins while 3 (3.4%) patients were prescribed the combination of ASA, statin and warfarin. The remaining patients were not prescribed any medication for treatment of their medical condition. Besides, Ceftriaxone with metronidazole was the most commonly prescribed antibiotics (38, 34.2%) in hospitalized stroke patients (Table 4).

Treatment outcome of hospitalized stroke patients

As depicted in Figure 2, 69 (62.2%) had shown good treatment outcome while 42 (37.8%) had poor treatment outcome. Among participants with poor treatment outcome, 18 (42.8%) were end up with death and 12 (28.6%) of participants were referred to other higher health facility for better treatment.

Factors associated with of poor treatment outcome of stroke

The result of multivariate logistic regression analysis demonstrated that patients older than 50 years (AOR = 3.256, 95%CI = 1.145, 9.260, P = 0.026) and substance abusers (AOR = 2.684, 95%CI = 1.091, 6.604, P = 0.046) were three times more likely to have poor treatment outcome as compared to their counter parts. Additionally, patients who had a chief complaint of hemiplegia were 0.75 (AOR = 0.25, 95%CL = 0.091, 0.708 P = 0.009) times less likely to have poor treatment outcome than other complaints. Nonetheless, other variables were not significantly associated with poor treatment outcome (Table 5).

Discussion

In the present study, the mean age of patients was 63.2 ± 12.6 years, which is in line with other previous studies conducted in Ethiopia (8,10). However, it is lower than (70 ± 13) Iranian study (15) and higher than other studies conducted in Ethiopia 52 ± 16 (16), 53.3 (17) and 44.2 ± 16.6 (12). The prevalence of stroke was comparable in males (49.5%) and females (50.5%) which is in agreement to other cross sectional studies done in Ethiopia (14, 16), Iran (15) and Sri Lanka (12).

The finding of this study revealed that ischemic type of stroke was predominated in 80.1% of total stroke victims. This is in line with various studies conducted at different part of world; 55.6% (8), 56.7% (9), 65.8% (10), 69.4% (14), 85.7% (12) and 91.7% (18). Contrastingly, hemorrhagic stroke was the most common in studies conducted at St. Paul's Teaching Hospital (61.3%) (13), Jimma (64.3%) (19) and Rwanda (65%) (20). This disparity might be due to the difference in the prevalence of risk factors and co-morbidities especially cardiovascular risk factors in St. Paul's Teaching Hospital, Jimma and Rwanda.

Moreover, 84.7% of the study participants had one or more co-morbid conditions prior to hospitalization due to stroke. Hypertension was the predominant co-morbid condition prevalent nearly in half of the study participants (52.1%) with a high frequency of occurrence (17, 85%) in hemorrhagic stroke patients. This is in accordance with other studies done in Ethiopia (13, 21), Tanzania and Sri Lanka (12, 22, 23), which stated that hypertension was the most frequent co-morbid condition in stroke patients. Moreover, study done by Rymer (24) revealed that high blood pressure and ageing blood vessels were the major risk factor for the development of hemorrhagic form of stroke (24).

In our setting, the combinations (42, 44.6%) of ACEI + BB and ACEI with diuretics (23, 24.6%) were the most frequently used past medication regimens in the management of stroke co-morbidities. This finding is in line with various studies conducted on the management of hypertension with stroke. ACE inhibitors based combinations widely used for the treatment of high blood pressure, one of the major modifiable risk factor for stroke, in stroke patients. Hence, reducing blood pressure improves the outcomes in stroke patients. Various epidemiological studies done by Lawes *et al* (25), Elliott (26), Beckett *et al* (27) revealed that screening and lowering both systolic blood pressure and diastolic blood pressure was the most important target to reduce cardiovascular disease, and to prevent recurrence and mortality of stroke.

In the management of ischemic form of stroke, Acetyl salicylic acid based combinations (93.3%) were predominantly used in our setting. This finding is in contrast to various studies done by Bernheisel *et al* (28), Bansal *et al* (29), Goldstein (30) and Adams *et al* (31), which reported that intravenous injection of tissue plasminogen activator (t-PA) was predominantly used in the management of ischemic stroke. This could probably be due to the financial constraints and inaccessibility of tissue plasminogen activator (t-PA) at the study setting. In 60% of hemorrhagic stroke patients, mannitol was used to reduce cerebral edema. Despite the effectiveness of mannitol in hemorrhagic stroke needs further investigations, different clinical trials done by Wang *et al*. (32), and Aminmansour *et al* (33) reported that the initial use of mannitol seemed safe but might not reduce hemorrhage size. During hospitalization, ceftriaxone with metronidazole was the most commonly prescribed antibiotics (38, 34.2%) in the management of hospital-acquired infections.

Regarding outcome of stroke patients, in-hospital mortality rate and referral to higher health facility were recorded in 16.2% and 10.8% of patients, respectively. This finding is in agreement with other studies done by Gebremariam *et al* (8), Kassaw (21), Greffie *et al* (14), Temesgen *et al* (10) and de Carvalho *et al* (34). However, it is lower as compared to studies done at St. Paul's Teaching Hospital (30.1%) (13) and Jimma University Hospital (37.87%) (19). This disparity could probably be due to the high prevalence of hemorrhagic stroke and the difference health care system in St. Paul's teaching hospital and Jimma University hospital. Various studies done by Jowi and Mativo (35), Asefa *et al* (36), Greffie *et al* (14) revealed that hemorrhagic stroke was significantly more lethal than ischemic stroke.

Even though respiratory failure secondary to aspiration pneumonia was not significantly associated with treatment outcome, it is the frequent contributor of death in the study setting. This may be probably due to small sample size in our study. It is in accordance with other hospital based study done at University of

Gondar Teaching Hospital (8) and population based cross sectional study in China(18). In contrast to this, a study done in Rwanda showed that initial presentation with severe stroke was the major cause of death among stroke patients (20).

During multivariate logistic regression analysis showed that being older (> 50 years) ($P = 0.026$, AOR = 3.256), was significantly associated with poor treatment outcome as compared with their counterparts. Correspondingly, previous studies done in Ethiopia by Kassaw and in Sri Lanka by Chang *et al*/reported that poor treatment outcome in stroke patients was observed in elderly patients (12, 21). This may probably be linked to the presence of various co-morbidities and complications in elderly patients.

In the present study, being substance abuser had three-fold higher risk of poor treatment outcome ($P = 0.046$, AOR = 2.684) which is similar to studies conducted in Tikur Anibessa Specialized hospital and Felege Hiwot Referral Hospital in Bahir Dar (9, 21). In contrast to this finding, social history was not significantly associated with poor treatment outcome in the study conducted at Shashemene Referral Hospital, Ethiopia and Indonesia (10, 37). This disparity may be attributed to the difference in socio-demographic characteristic of the study participants.

The presence of hemiparesis during the initial hospital admission was found to be significantly associated with poor treatment outcome ($P = 0.009$, AOR = 0.254) in our finding. This is in line with other findings reported by Temesgen *et al*, Chang *et al* and Kassaw (10, 12, 21). Contrastingly, Rwandan study by Nkusi *et al*/revealed that loss of consciousness was found to be significantly associated with poor treatment outcome (20). Disparity of this finding might be attributed to the high prevalence of hemorrhagic stroke than ischemic stroke among study participants by 1.85:1 in Rwanda (20).

Even though the presence of co-morbid conditions and types of stroke were found to be significantly associated with poor treatment outcome in different studies (8, 37, 38), it was not significant associated in our finding. The difference might be attributed to small sample size in our study to predict significant association between poor treatment outcome and contributing factors.

Limitation Of The Study

This is a hospital-based study and as such, the results cannot represent 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 the health care providers. Besides, significant number of patients discharged against medical advice, which made the in hospital mortality is non-representative of the short-term mortality. The sample size was small enough to predict true significance association between independent variable and treatment outcome.

Conclusion

The present study showed that ischemic stroke was the most predominantly diagnosed type of stroke in our setting. Acetyl salicylic acid and ACE inhibitor based regimens were frequently used in the

management of stroke and hypertension. Nearly one third of the study participants had good treatment outcome. Nonetheless, death was reported in 16.2% of hospitalized stroke patients in the study setting. Being older and substance abusers, and the presence of hemiparesis during the initial hospital admission were significant predictors of poor treatment outcome.

Abbreviations

AURH Ambo University referral hospital

RR Rate ratio

TIA Transient ischemic attack

WHO World health organization

SPSS Statistical Package for the social sciences

AVM Arterio venous malformation

AHA American heart association

OPD Out Patient Department

Declarations

Ethical approval and consent to participate

Declarations

Approval and permission were sought from Ethical Review Board of college of medicine and health sciences, Ambo University. Consent to participate is not applicable.

Consent for Publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors have declared that no competing interests exist.

Author's contribution

BK and GB conducted the actual study and the statistical analysis. BK, GB, GT and AD were involved in developing the idea, designing of the study and the write up of the manuscript. All authors approved the submitted version of the manuscript.

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Tables

Table1: Socio-demographic characteristics of hospitalized stroke patients at Ambo University Referral Hospital (N=111)

Variables		Frequency(n)	Percent (%)
Age	≤50	25	22.3
	>50	86	77.5
Sex	Male	55	49.5
	Female	56	50.5
Social history	Substance abuse	37	33.3
	Not substance abuse	74	66.7
Marital status	Single	5	4.5
	Married	97	87.4
	Divorced	9	8.1
Occupation	Farmer	44	39.6
	House wife	43	38.7
	Government employees & others*	24	21.6
Educational status	Unable to read and write	68	61.3
	Able to read and write	43	38.7

* Students, unemployed

Table 2: Clinical characteristics of stroke patients at Ambo University Referral Hospital (N=111)

Variable		Frequency (N)	Percent (%)
Chief complaint	Hemiplegia/paresis	85	76.6
	Others [¥]	26	23.4
Brain imaging	Yes	28	25.2
	No	83	74.8
Time from onset to hospitalization	≤48 hour	42	37.8
	>48 hour	69	62.2
	Mean time	58.15±1.6 hours	
Co-morbidity	Absent	17	15.3
	Present	94	84.7
Specific co-morbidity (n=94)	Hypertension	49	52.1
	Atrial fibrillation	22	23.4
	Diabetes mellitus	9	9.6
	Other [*]	14	12.6
Complication in the hospital	Absent	83	74.8
	Present	28	25.2
Specific complication (n=28)	Aspiration pneumonia	24	85.7
	Increased ICP	3	10.7
	Bed sore	1	3.6
Length of hospital stay	≤ 5days	70	63.1
	≥ 5 days	41	36.9
	Mean day	6.02	±3.24 days

(cardiovascular disease, previous stroke/TIA (transient ischemic attack), HIV/AIDS, TB), [¥](Loss of consciousness, aphasia, severe headache, both side body weakness)

Table 3: Past Medications history of hospitalized stroke patients at Ambo University Referral Hospital (N=94)

Past medication	Frequency (N)	Percentage (%)
ACEI with BB	42	44.6
ACEI with diuretic	23	24.6
Digoxin with BB	11	11.7
Digoxin with ACEI [#]	10	10.6
Oral hypoglycemic agent	8	8.5

*Metoprolol/Atenolol; #Enalapril

Table 4: Medication used during hospitalization for stroke patients at Ambo University Referral Hospital (N=111)

Medication used in hospital	Frequency (N)	Percent (%)
ASA + Statin	80	89.9
ASA + warfarin + Statin	3	6.7
Diuretics (mannitol)	12	10.8
ACEI with amlodipine	24	21.6
Oral hypoglycemic agents	8	7.2
Antibiotics	38	34.2

ASA=Acetyl salicylic acid, ACEI=Angiotensin converting enzyme inhibitors

Table 5: Univariate and multivariate logistic regression analysis of predictors of poor treatment outcome among hospitalized stroke patients at Ambo University Referral Hospital

			Univariate analysis		Multivariate analysis	
Variables		Frequency (N) (%)	P- value	COR (95%CI)	P- value	AOR (95%CI)
Age (years)	≤50	25(22.5)		1.000		
	>50	86(77.5)	0.003	0.244 (0.095-0.622)	0.026	3.256(1.145-9.260)
Social history	Substance abuse	37(33.3)	0.040	2.341(1.040-5.267)	0.046	2.684 (1.091-6.604)
	No substance abuse	74(66.7)		1.000		
Chief compliant	Hemiplegia	85(76.6)	0.001	0.221 (0.087-0.561)	0.009	0.254 (0.091-0.708)
	Others*	26 (23.4)		1.000		
Residence	Urban	40 (46)				
	Rural	71 (64)	0.049	0.449 (0.202-0.997)		
Types of stroke	Ischemic stroke	89 (80.2)		1.000		
	Hemorrhagic stroke	20 (18.0)	0.210	1.871(0.703-4.980)		
Sex	Male	49 (49.5)		1.000		
	Female	50 (50.5)	0.103	0.523 (0.240-1.139)		

Loss of consciousness, aphasia, severe headache, both side body weaknesses, COR=crude odd ratio, AOR=adjusted odd ratio, CI=confidence of interval

Figures

Figure 1: Types of stroke diagnosed in stroke patients at Ambo University Referral Hospital.

Figure 1

Types of stroke diagnosed in stroke patients at Ambo University Referral Hospital.

Figure2: Treatment outcome of hospitalized stroke patients at Ambo University Referral Hospital.

Figure 2

Treatment outcome of hospitalized stroke patients at Ambo University Referral Hospital.