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ORIGINAL ARTICLE

MEDICAL AND NEUROLOGICAL COMPLICATIONS AMONG STROKE PATIENTS ADMITTED FOR INPATIENT CARE IN ADDIS ABABA, ETHIOPIA

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ABSTRACT

Background and Purpose: *Medical and neurologic complications of acute stroke adversely impact patient outcome and in some cases can be preventable. There is scarcity of data in the African medical setup and none to date in our country to our knowledge. The current study aims to describe types and frequencies of neuro-medical complications occurring in hospitalized patients after an acute stroke and to identify risk factors for development of these complications and the role of these factors on mortality.*

Methods: *A total of 71 patients with acute stroke (excluding Sub-arachnoid Hemorrhage) who were admitted to three hospitals in Addis Ababa from June 2008 to March 2009 were included in the study. These patients were prospectively followed until their discharge or death to look for the nature and frequency of neuro-medical complications. Basic demographic data, stroke related medical information, pre-existing medical conditions, admission laboratory and imaging findings were recorded. All events were documented for each patient using pre-defined medical complication using a data collection format. Descriptive and analytic statistical tests were performed to measure associations between risk and outcome factors.*

Results: *Stroke-complications were detected in 71.8% (51/71) of the study participants and the most frequent complication was aspiration pneumonia which occurred in 33.8% (24/71). Miscellaneous complications such as sepsis, hypokalemia exposure keratitis were detected in 25% (17/71) of stroke patients. Complications were more common in patients with severe neurologic deficit as measured by Glasgow coma scale (GSC) and old age. GCS < 12 and age > 40 years were both significantly associated with developments of complications after stroke ($p< 0.05$). A total of 17 (23%) patients died during their in-patient stay. GCS <12 was significantly associated with mortality related to stroke in the admitted patients ($p=0.0002$) while there was no association between old age and mortality.*

Conclusions: *Complications after stroke are common and are major factors contributing to mortality. Being aware of the types of common complications and associated risk factors helps the clinical team involved in the care of stroke patients to make preparations and plans for the best possible care and to take preventive measures that will save a lot of lives with best possible use of meager resources available such as educating the population to avoid oral feeding for patients with altered mental state and physicians to evaluate gag reflex bedside swallowing test and proper positioning of patients to avoid aspiration pneumonia. GSC measurement at admission is an important predictor of complications and death following stroke.*

Key words*: Stroke, Complications, Neuro-medical, Inpatient, Ethiopia*

INTRODUCTION

Stroke is a sudden and usually devastating neurologic illness which leaves its victims often dead or disabled. This fact has been and is continuing to be experienced by Ethiopian patients admitted to different hospitals in the country [1-5]. The hospital burden due to stroke and its complications appears to increase as the aging population increases in number and non-communicable disease continue to increase in number compared to communicable illnesses in urban areas [6-7]. Two previous studies in Ethiopia have reported mortality rates in stroke patients (hemorrhagic and ischemic) as 23% and 28.6 % respectively [3-4], while other studies in Ethiopia, have shown relatively higher figures i.e. 40% and 44.5% respectively [8] [5]. These are very high compared to rates reported in the economically developed countries which ranges from 4 to 23% [6]. Medical complications are common following stroke and are seen in 52-96% of them and they account for 40-59% of deaths [6] [7] [9]. The most common types of medical complications that occur are pneumonia, urinary tract infections, venous thrombosis, pressure sore,

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joint and soft tissue pain. The severity of stroke is the strongest predictor of event recovery [6] [7] [9]. In addition the presence of pre-existing medical conditions like hypertension, Diabetes Mellitus (DM) and length of hospital stay together with the setup of care were found to determine the development of complications [10] [11]. A stroke care provided by a staff which is trained and applying preventive measures and looking scrupulously for medical complications will detect them early and manage them earlier. This will avert major disasters and thereby results in reduced mortality, short hospital stay, and better functional outcome [7].

As to our knowledge, as there is no recent clinical data on the outcomes of acute stroke after hospital admission, this study was designed to assess types of neuro-medical complications and mortality following stroke, and factors associated with the mentioned outcomes.

METHODS AND MATERIALS

A total of 71 eligible patients with a primary diagnosis of stroke and ≥ 18 yrs old, admitted between June 2008 and February 2009 to three hospitals in Addis Ababa (i.e. Tikur Anbesa Specialized Hospital (TAH), Bethel Teaching Hospital (BTH) and Zewditu Memorial Hospital (ZMH)), were included in the study. We excluded sub-arachnoid hemorrhage and patients with age <18 years. No sampling was employed as all eligible patients admitted to the three hospitals during the study period were included in the study. Stroke was defined according to the WHO definition [12].

On admission age, sex, marital status, job, educational level, duration between stroke onset and admission were recorded as well as type (either hemorrhagic or ischemic) and location of cerebral lesion based on its anatomic site. Hemorrhagic stroke does not include subarachnoid hemorrhage. Length of hospital stay as well as Glasgow come scale (GCS) for each patient was recorded by the attending physician. Pre-existing medical conditions were identified using patient and family interview. Medical conditions and complications which happened after the acute stroke during their hospital stay were recorded using pre-defined criteria used in other similar studies [6, 13]. The investigators continuously and prospectively monitored and documented the occurrence of medical complications during inpatient stay. Analysis was limited to medical complications which are assumed to be common (pressure sore, urinary tract infection (UTI), pneumonia, epileptic seizure, deep vein thrombosis (DVT) and pulmonary embolism (PE)) based on earlier studies [6,13]. Descriptive measures such as proportion and mean were used as required. Multivariate logistic regression was done to determine associations between stroke complications and potential risk factors. For tests of significance, p-value less than 5% was considered significant.

The study got ethical approval from Department of Neurology, School of Medicine at Addis Ababa University (AAU). And additional permissions were obtained from the participating Hospitals. Verbal informed consent was obtained from all study participants; it was obtained from relatives and guardians when the patient's mental status was not appropriate to give informed consent.

RESULTS

During the study period 71 eligible patients admitted in the three hospitals were followed. Of all the patients or caregivers approached none refused to participate. Socio-demographic description and stroke characteristics of these patients were provided in Table 1. Majority i.e. 43 (61%) were males and 28 (39%) were females and mean age was 52.7 years (SD 17.6). A total of 56 (80.3%) patients were admitted in general wards and 14 (19.7%) in the Intensive Care Unit (ICU). The overall mean length of in-hospital stay was 12.59 days with an overall total period of observation of 894 hospital days. Mean delay between stroke onset and hospital admission was 38 hrs.

There were a total of 28 (39.4%) patients with hemorrhagic stroke and 43 (60.5%) with ischemic stroke. Except four cases, all diagnoses were established using either Computerized Tomography (CT) or Magnetic Resonance Imaging (MRI). The four unscanned cases, who were not able to afford for imaging, were attributed to have ischemic stroke based on their clinical profile. There was one case of ischemic stroke with hemorrhagic transformation. Another case of ischemic stroke was later found to have sagital sinus thrombosis with ischemic infarct. Frequencies of pre-existing medical conditions among the patients reported were hypertension (53%), DM (12.5%), atrial fibrillation (6.3%), Rheumatic Valvular Heart Diseases (6.3%) and history of smoking (9.4%) (Table 2).

Table 1 : Socio-Demographic Characteristics of stroke patients admitted to three hospitals in Addis Ababa, Ethiopia Feb-March 2009 (n=71)

Characteristics	Number	Percentage
Age		
Age (mean ± SD)	52.76 ± 17.6	
Age Groups		
18-20	3	4.2
21-30	4	5.6
31-40	14	19.7
41-50	12	16.9
51-60	14	19.7
61-70	15	21.1
71-80	6	8.5
81-90	3	4.2
Sex		
Female	28	39.4
Male	43	60.6
Educational status		
Illiterate	25	39.1
Elementary	16	25.0
High School	13	20.0
College	9	14.1
Occupation		
Farmer	6	8.5
House wife	12	16.9
Retired	4	5.6
Government employee	10	14.1
NGO	2	2.8
Jobless	3	4.2
Other	34	47.9

Table 2 : Pre-existing underlying medical conditions among stroke patients admitted to three hospitals in Addis Ababa, Feb-March 2009 (n=71)[1]

Medical Condition	**Number (%)**
Hypertension	34 (53.1)
Diabetes mellitus	8 (12.5)
Atrial Fibrillation	4 (6.3)
RVHD	4 (6.3)
Other CV diseases	7 (10.9)
Smoking History	6 (9.4)
Renal illness	4 (6.3)
Seizure	2 (3.1)
Past History of stroke	5 (7.8)

[1]The numbers reported are the individual underlying medical conditions not number of patients

At least one complication occurred in 71.9% (51/71) of the patients. The types and frequencies of the ten clinically significant neuro-medical complication that occurred during inpatient stay are listed in Table 3. The most common complication was aspiration pneumonia in 24 (33.8%) patients followed by Urinary Tract Infection (UTI) in 13 (18.3%) of them. A total of 17(23.9%) patients developed miscellaneous complications such as sepsis, hypokalemia and exposure keratitis. Five (12%) patients developed more than one type of complication. Aspiration pneumonia commonly occurred in the first ten days (40.8%); of which majority were in the first five days (37.5%). UTI, however, was uncommon in the first 10 days (33.4%), when compared to days 11 to 21 (41.7%). Development of complications was significantly associated with a GSC below 12 ($p< 0.05$) and age >40 years ($p=0.012$). However, development of complication had no statistically significant association with sex, marital status, education, occupation, past history of hypertension, DM and atrial fibrillation (Table 4).

Table 3 : Types of Complications among stroke patients admitted to three hospitals in Addis Ababa, Feb-March 2009 (n=71)

Medical Complication	**Number**[2]	**Percentage**
Urinary tract infection	13	18.3
Aspiration pneumonia	24	33.8
Hospital Acquired pneumonia	9	12.6
Seizure	4	6.5
DVT	2	2.8
Pressure sure	1	1.4
GI- Hemorrhage	1	1.4
Seizure	4	5.6
Miscellaneous	17	25

[2]The numbers reported are the individual complications not number of patients with complications.

Table 4 : Factors associated with development of complications among stroke patients admitted to three hospitals in Addis Ababa, Feb-March 2009

Variables	Developed Complications (n= 51)	No complications (n= 21)	Crude OR (95% CI)	p-value
Age				
=/< 40 yrs	21 (60)	14 (40)	1	
> 40 yrs	30 (85.7)	5 (14.3)	3.92 (1.25, 13.82	0.015
Sex				
Male	32 (74.4)	11 (25.6)	1.38 (0.43, 4.45)	0.74
Female	19 (67.9)	9 (32.1)	1	
History of Hypertension				
Yes	28 (73.7)	10 (26.3)	1.22 (0.38, 3.88)	0.91
No	23 (69.7)	10 (30.3)	1	
Delay in admission				
=/ >24 hr	29 (72.5)	11 (27.5)	1.08 (0.34, 3.45)	0.90
<24 hr	22 (71)	9 (29)	1	
Duration of Hospital stay				
<7 days	19 (86.4)	3 (13.6)	3.27 (0.75, 16.32)	0.13
=/ > 7 days	31 (66)	16 (34)	1	
Admission GCS				
<12	24 (88.9)	3 (11.1)	5.04 (1.17, 24.78)	0.025
=/>12	27 (61.4)	17 (38.6)	1	
Types of Stroke				
Hemorrhagic	21 (75.0)	7 (25.0)	1.3 (0.39, 4.37)	
Ischemic	30 (69.8)	13 (30.2)	1	

Table 5 : Factors associated with mortality among stroke patients admitted to three hospitals in Addis Ababa, 2009

Variables	Died (n=17)	Survived (n=54)	Crude OR (95% CI)	p-value
Age				
>40	15 (30)	35 (70)	4.07 (0.76, 28.85)	0.12
<40	2 (9.5)	19 (90.5)	1	
Sex				
Male	11 (25.6)	32 (74.4)	1.26 (0.36, 4.55)	0.90
Female	6 (21.4)	22 (78.6)	1	
Delay in admission				
>24 hrs	11 (27.5)	29 (72.5)	1.58 (0.45, 5.68)	0.6
< 24 hrs	6 (19.4)	25 (80.6)	1	
Duration of hospital stay				
<7 day	12 (54.5)	10 (45.5)	10.08 (2.5,43.35)	<0.0005
>7days	5 (10.6)	42 (89.4)	1	
Admission GCS				
<12	13 (48.1)	14 (51.9)	9.29 (2.27, 41.13)	<0.005
>12	4 (9.1)	40 (90.9)	1	
Types of Stroke				
Ischemic	12 (27.9)	31 (72.1)	1.78 (0.49, 6.81)	0.49
Hemorrhagic	5 (17.9)	23 (82.1)	1	
Complications				
Yes	15 (29.4)	36 (70.6)	3.75 (0.69, 26.64)	0.12
No	2 (10)	18 (90)		
Ward				
ICU	11 (35.5)	20 (64.5)	3.11 (0.99, 9.72)	0.54
Non ICU	6 (15.0)	34 (85.0)		

A total of 17 (23%) patients died during their in-patient stay. Death rate was significantly higher for those who stayed relatively short duration in the hospital(OR=10.08;95% CI:2.5-43.35;p-value=<0.0005) (Table 5). Mortality was higher for cases of ischemic stroke (22%) than hemorrhagic stroke (17%) (p=0.49). Mortality was higher in patients who were in the ICU (35.7%) compared to those in the general wards (21.4%) (p value= 0.05). Mortality was not significantly associated with the complication of aspiration and hospital acquired pneumonia and other complications such as Deep Venous Thrombosis (DVT), UTI, or seizures (p= 0.12).

When we compare mortality among types of pneumonia as a complication, out of the 8 patients with hospital acquired pneumonia 4 (50%) died in hospital; while out of the 24 patients with aspiration pneumonia 10 (41.7%) died in the hospital.

There was a statistically significant association between GCS (<12) and mortality after admission (OR 12.3 (3.4-34.9); p=0.00002). Patients' neurologic status as measured by Glasgow coma scale (GCS), which show that among the 17 patients with a GCS between 3-10, 11(64.7%) died and of those 53 patient with a GCS between 11-15, 6(11.1%) died (Table 5).

DISCUSSION

This study provides prospectively collected inpatient hospital data on medical and neurologic complications following stroke. The findings confirmed that medical complication are frequent after stroke [6] [7] [14]. In this study about 72% of patients admitted with stroke developed various medical complications including the miscellaneous complications (such as sepsis, hypokalemia and exposure keratitis). However in some of the studies these miscellaneous complications were not taken as post stroke medical complications [15] [9] [10] [16]. But when we only consider the commonly reported stroke related major medical complications (pressure sore, UTI, pneumonia , epileptic seizure, DVT and PE), the proportion of post stroke complications was 58%. For this study definitions of complications of stroke were based on similar studies done earlier [13] [6].

Complication were recorded from the time of admission and the mean duration of stroke onset to admission was 38 hr and is not very different from other western setups which are thought to have the capacity to catch complications which occur early and lead rapidly to death [17].

Our mortality rate is comparable to the findings from developed countries [7] while it differs from other local studies and the Gambian study [5] [18]. In the current study, ischemic stroke was more frequent than hemorrhagic stroke and mortality was higher in the ischemic than in the hemorrhagic stroke. This finding is different compared to a relatively recent finding [5]. In an earliest Ethiopian study ischemic stroke was found to be more prevalent than hemorrhagic [4]. However, this study was done in the time when there were no routine imaging such as CT and MRI.

Some of the frequencies of complication in this study are comparatively similar to other studies. We have tried to compare each of the complications with other study reports as follows. Pneumonia was diagnosed more frequently in this study (i.e. 33.8% for aspiration pneumonia and 12.6% for hospital acquired pneumonia). This figures are much higher than rates reported in other studies [13] [6] [9]. This might occasionally be due to attribution of simple aspirations and auscultatory chest finding to aspiration pneumonia without applying the diagnostic criteria strictly, as there were inconsistencies in applying the diagnostic criteria of aspiration pneumonia (including some investigations like CXR, CBC, Temperature and sputum analysis) by the first line treating physicians. This might have resulted in an over diagnoses of pneumonia. But having a the local tradition to give or to force drinking water or milk for critically sick and unconscious patients might contribute to the high levels of aspiration pneumonia in our setting.

Similar to other studies, UTI was found to be common (18.3%) [13] [7]. UTI was a relatively late-occurring complication (>1 days) in comparison to pneumonia in this study, due to its possible association with catheterization. Gastrointestinal hemorrhage (1.4%) was similar to the one reported by Dobkin (1%) [9]. however, it was lower than ones reported by Davenport (3%) [6] The prevalence of seizure in this study (5.6%) is similar to the rates of seizure experienced after stroke reported by earlier studies (4-4.5%) [6] [7].

No case of pulmonary embolism was detected in this study. This may be due to absence of diagnostic facilities and low index of suspicion by the attending physicians in addition to the rarity of the event (1-3% in other studies) [6] [9] [7]. The quality of the set-up where patient care is given may influence complication rate and outcome [11] [15] as has been shows by a higher mortality rate in TAH (i.e. 31%) compared to the well equipped private hospital at BTH (i.e. 15%). Though marginally insignificant, the higher mortality in the ICUs (35.7%) in comparison to general wards (21.4%) could be due to the severe clinical state of patients admitted to the ICUs.

The markedly lower rate of pressure sore seen here (1.4%) might be due to the extra attention and care the patients got due to the research by the attending nurses and family members or due to the shorter duration of hospital stay in our setups compared to other western setups [14]. As is shown in other similar studies, in this study development of complications was correlated with a lower GCS and older age. But unlike other studies past history of hypertension, DM and atrial fibrillation were not correlated to complication development [14] .

The strengths of this study include the fact that this is the first Ethiopian study which looked in to the various stroke complications and outcomes accompanied with a continuous clinical follow-up; and the study provides baseline rates of stroke related complications which may shed some light on the need for preventive strategy and to improve patient care and management. Being a prospective study, it avoids the methodological problem of retrospective identification of complications from case notes which could be incomplete.

As limitations, being a hospital based study, the findings may not represent all stroke patients who were not able to come for hospital care. In addition, the study is limited to the town of Addis Ababa it may not be representative of all Ethiopian stroke patients. Patients from settings where they were not able to get a hospital or professional care are not included in this study. In many cases the investigators were not the primary treating physicians and it was difficult to validate some of the diagnosis made by other physicians. Risk factors for the commonest complications dysphagia and urinary catheterization were not assessed for aspiration pneumonia and UTI respectively. Depression was just observed but not actively searched in this study. The smaller number of patients included in the study might have reduced the statistical power. Multivariate analysis was not done due to the small number of patients and therefore we were not able to control for potential confounders.

Conclusions: The findings of this study signify that post stroke neuro-medical complications are common in our set up and with few differences the pattern of these complications is comparable with other setups.

According to the current study, complications after stroke are common and are major factors contributing to mortality. Glasgow coma scale measurement at admission is an important predictor of complications and death following stroke. Being aware of the types of common complications and associated risk factors helps the clinical team involved in the care of stroke patients to make preparations and plans for the best possible care and also to take appropriate preventive measures. Despite lack of stroke units or stroke physicians in Ethiopia, a lot of life and the scarce resources we have can be saved with better awareness of complications and development of preventive protocols.

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