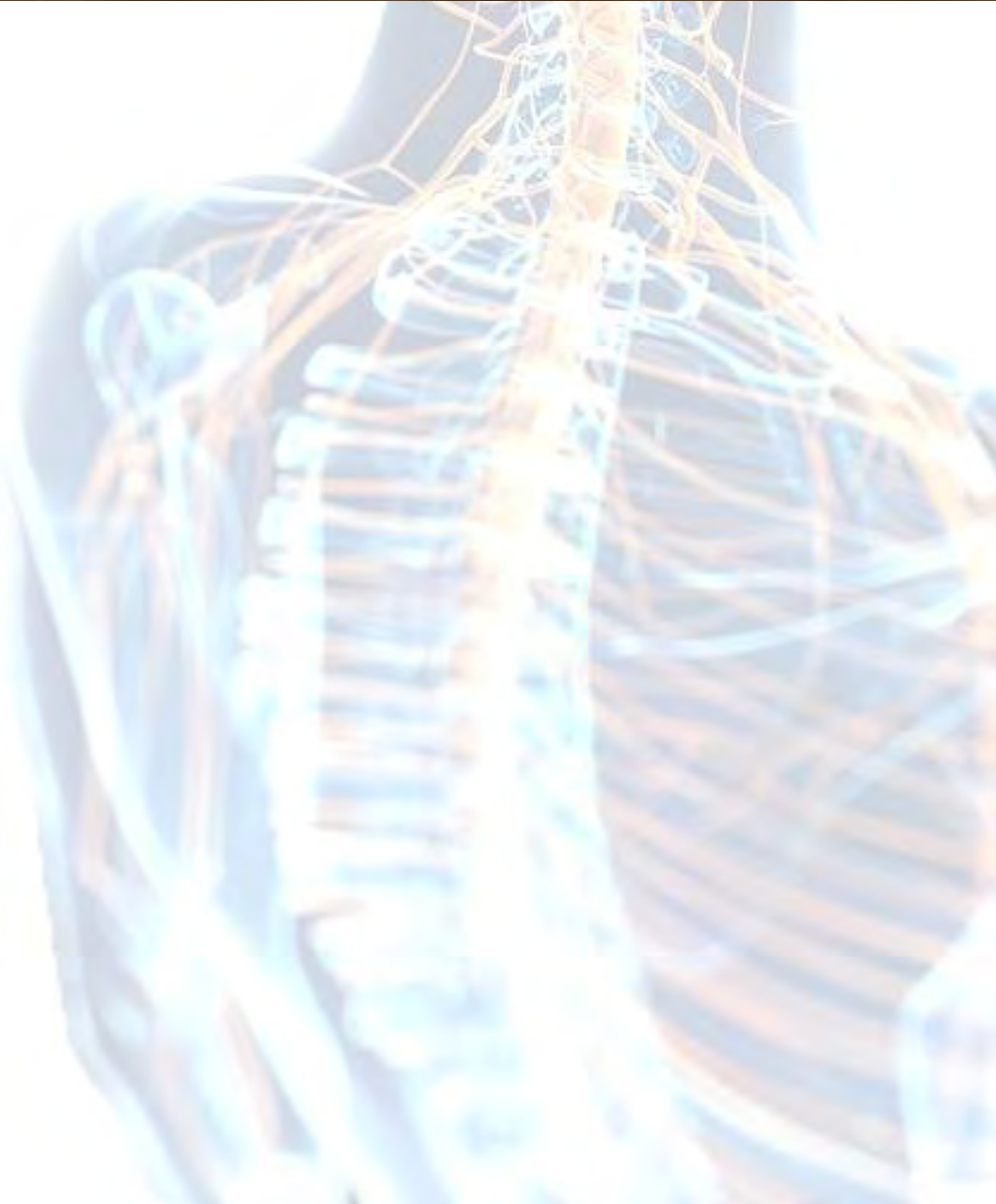




Pattern of Neurologic Emergencies in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia



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Pattern of Neurologic Emergencies in Tikur Anbessa Specialized Hospital, Addis
Ababa, Ethiopia

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Summary

Neurological emergencies are a frequent presentations and often times with devastating short and long term consequences. Neurological disorders are increasingly prevalent in Sub-Saharan Africa with the paucity of data on adult neurological emergencies in the region. The objective of the study was to determine the pattern of neurologic emergencies in TASH, Addis Ababa, Ethiopia. Medical records of 311 adult patients presented to Tikur Anbessa Specialized University Hospital from February 1, 2013 to January 31, 2014 were reviewed retrospectively. The mean age of the patients was 44.68 ± 1.1 years. Males outnumbered Females giving a sex ratio (M: F) of 1.22:1. Neurological emergencies accounted for 5.27% of the total medical emergencies. The most common neurologic emergencies were cerebrovascular disorder (54%), neurologic complications of HIV/AIDS (9%), meningitis (8.7%) and seizure disorder (7.7%). Hemiparesis, altered mental status and convulsion were the common presenting features accounting 44%, 19.3% and 13.1%, respectively. The overall mortality rate of neurologic emergencies was 27.3% with the highest case fatality rate from Encephalopathy 53.8% followed by Tetanus 50%, neurologic complications of HIV/AIDS 39.3%, meningitis 37% and cerebrovascular disorder 27.4%. It will be very useful for health care policy makers if they focus on planning for better management and prevention of common neurologic emergencies.

Acronyms

AAU: - Addis Ababa university
AIDS: - Acquired Immunodeficiency Syndrome
CLD: - Chronic liver disease
CMV: - cytomegalovirus
CNS: - Central Nervous System
CNS: - Central Nervous System
CRVHD: - Chronic Rheumatic valvular heart disease
DM: - Diabetic mellitus
DVT: - Deep vein thrombosis
ED: - Emergency Department
ER: - Emergency Room
HIV:-Human immunodeficiency virus
ICH: -intracranial hemorrhage
ICU: - Intensive care unit
IRB: - Institutional Review Board
MICU: - Medical Intensive care unit
PML: - progressive multifocal leukoencephalopathy
PTE: - Pulmonary thromboembolism
SAH: - Subarachnoid hemorrhage
TASH: -Tikur Anbessa Specialized hospital
UK: - united kingdom
USD: - united state dollar

1) Introduction

Neurological emergencies are emergencies due to diseases of the central and peripheral nervous system. It can involve the brain, spinal cord, cranial nerves, peripheral nerves, nerve roots, autonomic nervous system, neuromuscular junction and muscles. Neurological emergencies are common and frequently devastating. Every year, millions of peoples suffer an acute stroke, subarachnoid hemorrhage, status epilepticus, or spinal cord disorders severe enough to require medical intervention. ^[2]

Neurological disorders are increasingly prevalent in Sub-Saharan Africa. The factors that are producing this increased burden include malnutrition, malaria, HIV/AIDS and other causes of encephalitis and meningitis, demographic transitions, increased vehicular traffic, and persistent regional conflicts. Leading neurological disorders include epilepsy, peripheral neuropathy, stroke, and, increasingly the nervous system complications of HIV/AIDS and alcohol abuse ⁽²⁾. The disabling rather than fatal nature of many neurological disorders, the stigma associated with brain disorders, and the enormous difficulty in gathering epidemiologic data have resulted in their being under reported and neglected in Sub-Saharan Africa ⁽²⁾. This neglect represents an unfortunate paradox, since neurological disorders make up at least 25 percent of the global burden of disease and are responsible for an even greater proportion of persons living with disability ^[2]

Neurological disorders and their complications are currently estimated to affect as many as a billion people worldwide ^[5]. The annual economic cost of neurological diseases amounted to approximately 180 billion USD in 2004 ^[5], contributing about one fifth of all hospital admissions^[6], which is progressively increasing over the years ^[9], there by being a significant cause for global morbidity and mortality. Neurological diseases are estimated to lead to 5.7 million deaths annually, causing about 10% of total deaths every year around the world. It was remain one of the top three killers by 2030. ^[10] Amongst the burden estimation, neurological diseases would cause 46 million disability-adjusted life years, more than half of which would come from the developing countries. It is estimated that by 2030, neurological disorders would be responsible for more than 9% of total disability-adjusted life years in the lower & middle income countries ^[10].

Some common and some uncommon, neurologic emergencies are potentially preventable or treatable. Examples include epilepsy, stroke in younger individuals, and neurological complications related to HIV infection. ^[2]

Data on causes of death from the 1990s have shown that neurovascular diseases remain a leading cause of death. In 2001 it was estimated that neurovascular diseases (stroke) accounted for 5.5 million deaths worldwide, equivalent to 9.6 % of all deaths ⁽¹⁴⁾. Two-thirds of these deaths occurred in people living in developing countries and 40% of the subjects were aged less than 70 years. Additionally, neurovascular disease is the leading cause of disability in adults and each year millions of stroke survivors has to adapt to a life with restrictions in activities of daily living as a consequence of neurovascular disease. Many surviving stroke patients were often depend on other people's continuous support to survive. ⁽¹⁴⁾

Neurological disorders are responsible of more than 20% of the world's burden of disease while neurological and psychiatric disorders are responsible for up to 28% of all years of life lived with disability ⁽¹³⁾. Neurological disorders contributed to 92 million disability-adjusted life-years in 2005 and were projected to 103 million in 2030. The burden of these neurological diseases is higher in developing countries that constitute about 85% of the world's population. ⁽¹³⁾ However, there is paucity and scarcity of literature on neurological diseases in Ethiopia which resulted in neurologic conditions both under-recognized and under-treated. This study was therefore undertaken to determine the pattern of neurologic emergencies in emergency setting and then, it will help to identify priorities among neurological patients and prepare the hospital to better management of such cases in a socio- culturally appropriate and cost-effective manner and also serve as a baseline in planning health policies and distribution of scarce resources in Ethiopia where facilities for emergency care are grossly inadequate.

2) Literature review

Infections involving the central nervous system (CNS) are important causes of mortality and morbidity in many African countries. World-wide, the scenario of CNS infections is changing mainly due to the increase in immuno-compromised patients (due to AIDS and prolonged survival of patient with malignancies), and widespread use of antibiotics creating the emergence of resistant organisms. Even though CNS infection is common the socio demographic and epidemiological transition in developing countries has also changed the morbidity and mortality pattern among communities. This has brought non-communicable diseases to the forefront of the health-care delivery system. Within this group, neurological disorder constitutes a significant proportion affecting morbidity, mortality, disability and quality of life.^[23]

2.1) Clinical profile of neurologic disorders

In retrospective study of the registered patients in the emergency department of the University of Calabar, Nigeria, Neurological emergencies accounted for 25.7% (284) of the total medical emergencies. The most common diagnoses were stroke (52.5%), Meningitis (11.3%) and hypertensive encephalopathy (7.0%). In contrary Epilepsy (0.7%) and Guillain- Barre syndrome (0.35%) were uncommon. Majority of the neurological patients were males, constituting 56.7%. The mean age of the patients with neurological emergencies was 49.76 years old⁽³⁾ In other 8 year retrospective study in Nigeria on morbidity and mortality of neurologic disorders in ICU showed that 16.6% of the total ICU admissions with neurological morbidity were admitted during the period. They observed that morbidity was high for preventable etiologies such as tetanus constituting 13.9%, hypertensive encephalopathy constituting 6.4% and meningitis constituting 4.8 % and the mean age of the patients was 25.4 ± 14.4 years.⁽⁷⁾

In UK Craig et al (1997)¹ studied new patient attendances at the Accident and Emergency Department at the Royal Victoria Hospital, and noted that 8% had a neurological illness. Headache comprised 55%, loss of consciousness 15%, balance difficulties 7%, power loss 5%, sensory difficulties 5%, acute visual failure 5% and convulsions or seizures 4%. Headaches and loss of consciousness made up 74% of these Accident and Emergency attendances⁽⁴⁾

On study conducted in 2008 the most common neurological diseases in Darfur were infections of the central nervous system characterized by meningitis during the dry seasons and cerebral malaria following the short rainy autumn. Epilepsy, mostly symptomatic, is largely caused by untreated or poorly treated CNS infection, head injury and neonatal/childhood diseases, whether infectious or congenital (due to high levels of consanguineous marriage). Stroke is frequently seen in younger patients who are not fully investigated, and the underlying cause is rarely identified. ⁽⁸⁾

In retrospective study of medical records done by Bower JH, Asmera J, Zebenigus M, Sandroni P and Bower SM on the pattern of neurological disease seen in Ethiopian patient's hospitalized in general medical wards in two hospitals in Addis Ababa indicated Neurologic cases made up 18.0% and 24.7 % of all medical admissions. Cerebrovascular disease, most commonly cerebral thrombosis, accounted for 45% of the neurological diseases seen. The second commonest disorder was meningitis (12%). Hepatic encephalopathy and intracranial haemorrhage, the latter commonly due to hypertension, were found to be the commonest causes of admission in coma. ⁽¹¹⁾

In retrospective review of the data bank from the Emergency Unit in Brazil showed Cerebrovascular disease (59.6% vs. 21.8%) was most frequent in the age group >50 years old, but Seizures (8.1% vs. 18.6%,) and primary headache (3.7% vs. 11.4%) were most frequent in the age group \leq 50 years old. ⁽²⁰⁾

In other retrospective study done in Germany the most common chief complaints were focal weakness (22%), headache (18.2%), dizziness or vertigo (16%), and seizure (14.2%). The presentation of patients varied as 47% presented without having been seen by another healthcare professional, 24% were referred to the emergency department (ED) following by some other outpatient provider for evaluation, and 29% were transferred from another ED. ⁽²¹⁾

In metropolitan France It has been shown that neurological problems account for approximately 15% of medical emergencies treated, in all types of medical establishments. Four major diagnostic groups are concerned: stroke, epilepsy and loss of consciousness, headache, confusional syndromes and behavioral disorders. Among patients seen in emergency units for neurological problems, 80% require hospital admission ⁽¹⁵⁾ in similar study in Spain it was found

that Stroke, headache and epilepsy were the most common disorders seen in ED. Up to 10–15% of medical emergencies were neurological. Their frequency increased with age⁽¹⁶⁾ but in other retrospective cross –sectional study done in India shows Neurological emergencies account for between 2.6 and 14% of medical emergencies and subjects had a mean age of 37.4 years, were mainly male (63%) and were victims of seizures (51.5%), stroke (24%) or unconsciousness (21%).⁽²²⁾

In a cross sectional study of patients admitted with a clinical diagnosis of stroke between September 2000 and August 2001 at Addis Ababa University Teaching hospital done by Zenebe G, Alemayehu M and Asmera J showed the mean age of 53.2 and M: F ratios of 1.5:1 were admitted. Hemorrhagic stroke was the most common cause of stroke accounting for 57% of all patients. The number of patients with stroke increased linearly until age group 55-64, with peak incidence in the age group 55-64 years accounting for a third of all admissions. Hypertension was the most frequent risk factor identified followed by cardiac disease, 65.6% and 22.7% respectively. The overall mortality was 44.5%. Altered mental state and non focal neurologic deficits were the only independent predictors of mortality⁽¹²⁾ In other Web search study conducted in Sweden has confirmed that stroke is more common among men than women and mean age (according to study size) for men was 68.6 years, and 72.9 years for women⁽³⁴⁾.

In retrospective study on the pattern and predictors of mortality of HIV/AIDS patients with neurologic manifestation in Ethiopia by Tesfaye Berhe, Yilma Melkamu and Amanuel Amare they found CNS opportunistic infections were the major causes of neurological manifestations of HIV/AIDS and the Causes of neurological manifestation were; cerebral toxoplasmosis (36.6%), tuberculous meningitis (22.5%), Cryptococcal meningitis (22.2%) and bacterial meningitis (6.9%). HIV-encephalopathy, primary central nervous system (CNS) lymphoma and progressive multifocal leukoencephalopathy were rare in their patients and the mean age was 34.6 years⁽³⁰⁾. But from study done in Georgia on neurological complications in patients with HIV/AIDS and it showed tuberculosis meningitis were the most common neurological disorders 34%, followed by CNS toxoplasmosis 22%, cryptococcal meningitis 15%, presumed CMV encephalitis 7%, PML 5%, primary CNS lymphoma 5% and bacterial meningitis 4%. The most common clinical manifestations identified of neurological disorders in HIV infected patients in the study were

headache followed by fever, focal neurological deficits, speech disturbances, cognitive dysfunction, visual disturbances, impaired coordination and seizures ⁽³²⁾.

On studies from Western Europe, showed that stroke incidence was about 30% higher in men than in women. For cerebral infarction the excess was 45%, whereas there was little difference between the sexes regarding intracerebral hemorrhage. For subarachnoid hemorrhage, the relationship between the sexes was opposite, with a male deficit of about 50 %. ⁽¹⁷⁾ Male patients are on average younger than female when they got their first stroke. And mean age for men was 68.6 years, and 72.9 years for women ⁽¹⁸⁾ in other similar study done in Sweden confirmed that stroke is more common among men than women. The difference tends to decrease with age. Women get their first stroke about four and a half years later than men. Both brain infarction and intracerebral hemorrhage are more common in men, but cardio embolic stroke, which is more severe, accounts for a larger proportion of strokes among women. ⁽¹⁹⁾ In demographically developed countries, the average age at which stroke occurs is around 73 years reflecting the older age structure of these countries. And In Caucasian populations approximately 80% of all strokes are ischemic, 10%-15% intracerebral hemorrhage (ICH), 5 % subarachnoid hemorrhage (SAH), and the rest is due to other causes of stroke. ⁽¹⁴⁾

GBS occurs world-wide with an overall incidence of 1 to 2 per 100,000 per year .While all age groups are affected, the incidence increases by approximately 20 percent with every 10-year increase in age beyond the first decade of life. In addition, the incidence is greater in males than in females ^(24, 25). And tetanus remains endemic in the developing world, and the incidence often increases following natural disasters such as earthquakes and tsunamis ⁽²⁶⁾. Approximately one million cases of tetanus are estimated to occur worldwide each year, with 300,000 to 500,000 deaths ⁽²⁶⁾. Among patients admitted for neurologic conditions to one hospital in Nigeria, for example, tetanus was the second most common cause (14 percent) after stroke ⁽²⁷⁾.

2.2) outcome of neurologic disorders

In the study on morbidity and mortality of neurologic disorders admitted in ICU in Nigeria the case fatality rates for tetanus, hypertensive encephalopathy and meningitis were 61.5%, 66.7% and 62.5% respectively. The case fatality rate for cerebral malaria was 100%. In addition, the overall mortality rate of neurologic disorders was high (52.4%)⁽⁷⁾. and from western study strokes are more severe in women, and case fatality was higher among women, case fatality for men was 19.7%, and for women 24.7%. Thus, case fatality was 1.25 times higher among women⁽¹⁹⁾.

A retrospective study conducted in Northwestern Nigeria showed the duration of hospitalization of patients with neurologic diseases was long, ranging from less than 1 day observed mainly in patients who died soon after admission, to 96 days, with a mean of 25 days. And twenty three percent of the cases of stroke died accounting this represented 65% of neurologic deaths, 18.8% medical deaths, and 2.37% hospital deaths⁽³³⁾.

Case-fatality rate for tetanus in developing countries range from 8 to 50 percent, whereas the majority of patients with tetanus recover when modern supportive care is available. Patients with shorter incubation periods have increased disease severity and mortality.⁽²⁸⁾ from study in Sweden Stroke in women have higher case fatality than men⁽³⁴⁾.

There is an appreciable mortality rate associated with bacterial meningitis even with the administration of appropriate antibiotics. The mortality rate increases linearly with increasing age. In a United States population-based surveillance study between 2003 and 2007, the case-fatality rate of bacterial meningitis in adults was 16.4 percent; among patients between 18 and 34 years of age, the case-fatality rate was 8.9 percent compared with 22.7 percent in patients' ≥ 65 years of age.⁽²⁹⁾

3) Objectives

3.1) General objective

- ✓ To assess the pattern and outcome of neurological emergencies among medical emergencies in TASH

3.2) Specific objectives

- ✓ To assess the clinical profile of neurologic emergencies in ED of TASH
- ✓ To identify the disposition of patients with neurologic emergencies from ED
- ✓ To determine the outcome of neurologic emergencies in TASH

4) Research Methods, materials, and procedures

4.1) Study area

The study was conducted in the emergency department of Tikur Anbessa specialized and Teaching Hospital. Tikur Anbessa specialized and Teaching Hospital is a tertiary health institution located in Addis Ababa, the capital city of Federal Democratic Republic of Ethiopia. The capital has a population of 2,738,248 as of 2007 census⁽¹⁾. The hospital receives patients from all regions of the country and the Emergency department provides emergency care for adult patients 24 hours a day. It runs an interdisciplinary emergency care where medical emergencies are attended to by emergency medicine physicians, internal medicine specialists, emergency medicine residents, internal medicine residents and other allied medical professionals

4.2) Study period: the study was conducted from December 2013 to June 2014

4.3) Study design: retrospective cross- sectional study of medical records of patients who were evaluated in ED from February 1, 2013 to January 31, 2014 at Addis Ababa University, college of health science Tikur Anbessa specialized hospital

4.4) Study population:

- Source population – All patients evaluated in ED of TASH
- Study population – All patients evaluated with neurologic emergency in ED of TASH

4.5) Sample Size and Sampling method

- All patients with neurologic emergency evaluated in ED from February 1, 2013 to January 31, 2014 who fulfill the inclusion criteria was taken as a sample size
- Convenient sampling method was used to select the study subjects.

4.6) Eligibility criteria

4.6.1) Inclusion criteria for the study was patients with neurological problems who are 13 years and older.

4.6.2) Exclusion criteria was non-neurological medical emergencies, neurosurgical emergencies including traumatic neurologic cases and patients with incomplete medical record

4.7) Data collection procedures: medical records of all neurological emergencies evaluated in ED of the hospital from February 1, 2013 to January 31, 2014 was reviewed using the data abstracting format prepared (annex). Data extraction format contains information from the case files included age, sex, residence, clinical presentation, confirmed diagnosis, co morbidity, outcome and disposition. The data was extracted by trained ED nurses using prepared format and the quality of the data was supervised.

4.8) Data processing and analysis procedure: The data was analyzed using Epi Info 3.5.4 and SPSS 16. Results was presented in simple descriptive statistics like frequency tables, graphs and proportions

4.9) Study Variable

✓ Independent variable

- age, sex, place of residence

✓ Dependent variable

- Confirmed diagnosis, chief complaint, co morbidity, length of stay, outcome and disposition

4.10) Ethical Considerations

Ethical clearance was obtained from department of emergency medicine. The purpose and data collection procedure of the study was clearly communicated and permission was obtained from the concerned body of the hospital. The confidentiality of the data obtained was kept by coding.

4.11) Dissemination and Utilization of Results

The final report will be presented as partial fulfillment of degree of masters in emergency medicine and critical care department and the result of the study will be disseminated through provision of hard copies to the concerned bodies including TASH. Dissemination through publication, presentation on annual scientific meetings, conferences etc will be performed

4.12) Operational definitions

- **Neurological emergency** is an emergency of the body nervous system. Structural, biochemical or electrical abnormalities in the brain, spinal cord or other nerves can result in a range of symptoms like paralysis, muscle weakness, poor coordination, loss of sensation, seizures, confusion, pain and altered levels of consciousness.
- **Stroke** is a neurological deficit that has a sudden onset, lasting more than 24 hours and results from cerebrovascular disease
- **Seizure** is a time-limited paroxysmal event that result from abnormal, involuntary, rhythmic neuronal discharges in the brain
- **Epilepsy**: is defined as a condition of unprovoked recurrent seizures without any known cause.
- **Guillain-Barre Syndrome** is a condition where, following a viral illness, the patient can develop weakness in the limbs and numbness
- **Disability-adjusted life years (DALYs)** is a summary measure of years of life lost because of premature mortality (YLL) and years of healthy life lost as a result of disability (YLD). One DALY can be thought of as one lost year of healthy life due to a specific disease, disorder or injury.
- **Transient ischemic attack (TIA)** is a brief episode of neurologic dysfunction resulting from focal temporary cerebral ischemia not associated with cerebral infarction and originally defined clinically by the temporary nature (<24 hours) of the associated neurologic symptoms.
- **Brain abscess** is a focal collection within the brain parenchyma, which can arise as a complication of a variety of infections, trauma, or surgery.

- **status epilepticus** refers to the occurrence of a single unremitting seizure with a duration longer than 5 to 10 minutes or frequent clinical seizures without an interictal return to the baseline clinical state
- **Acute meningitis** is life-threatening inflammation of the tissue layers that surround the brain and spinal cord that is often caused by a bacterial or viral infection. Symptoms develop over the course of a few hours to days
- **Chronic meningitis** is slowly developing inflammation of the layers of tissue that cover the brain and spinal cord and of the fluid-filled space between the meninges when it lasts 4 weeks or longer
- **Neurologic complications of HIV/AIDS** are HIV-related neurological disorders developed directly from infection with HIV, or indirectly as a result of opportunistic illnesses (OIs) or treatment complications
- **Headache disorder** is prolonged pain in the cranial vault, orbits, or nape of the neck. For this paper headache disorder is primary headache disorder according to international headache society.

5) Result

A total of 7643 medical emergency patients were evaluated in the ER of TASH in the study period, 403 (5.27%) were founded to be neurologic emergencies. Data forms were completed in 311 (77.17%) of the cases. Those with Incomplete information in their medical records 92 (22.83%) were excluded from the study.

Demographic data

Age and sex distribution: The sex distribution of patients was 171 (55%) males and 140 (45%) females, giving a sex ratio (M: F) of 1.22:1. The ages of the patients' ranges from 13 to 87 years with the mean age of 44.68 ± 1.1 years and median age of 45 years, 47.9% (149) of the patients were age 13 to 40 years old. The age distribution of patients is shown on table 1

Table 1. Demographic characteristics of patients with neurologic emergency cases evaluated in ED of TASH from February 1, 2013 to January 31, 2014

| Characteristics | Number | Percent |
|-------------------------|-----------------|---------|
| Sex(n=311) | | |
| Male | 171 | 55 |
| Female | 140 | 45 |
| Age (years) | | |
| 13 – 25 | 69 | 22.2 |
| 26 – 40 | 80 | 25.7 |
| 41 – 55 | 61 | 19.6 |
| 55 – 70 | 70 | 22.5 |
| >70 | 31 | 10 |
| Mean \pm SD | 44.68 ± 1.1 | |
| Median | 45 | |
| Residence(n=311) | | |
| Addis Ababa | 173 | 55.6 |
| Amhara | 17 | 5.5 |
| Gambela | 1 | 0.3 |
| Oromia | 76 | 24.4 |
| SNNP | 39 | 12.5 |
| Tigray | 5 | 1.6 |

Place of residence: - majority of patients came from Addis Ababa 173(55.6%) followed by Oromia 76(24.4%) and SNNP 39(12.5%). See residence distribution on table 1.

Clinical profile

Complaint and duration of illness during presentation to ED: The main complaint for neurologic emergency visit was hemiparesis (44%), followed by altered mental status (19.3%), and Convulsion (13.1%). The complaints are presented in Table 2. The mean duration of symptoms during presentation to ED was 6.96 days and the median was 3days.

Table 2. clinical profile of patients with neurologic emergency cases evaluated in ED of TASH from February 1, 2013 to January 31, 2014

| Clinical profile | Number | Percent |
|--|--------|---------|
| Presenting feature | | |
| Hemiparesis | 137 | 44 |
| Paraplegia | 20 | 6.4 |
| Quadriplegia | 11 | 3.5 |
| Altered mental status | 60 | 19.3 |
| Convulsion | 41 | 13.1 |
| Headache | 28 | 9 |
| Speech difficulty | 4 | 1.3 |
| Trismus | 4 | 1.3 |
| loss of sensation | 1 | 0.3 |
| neck stiffness | 1 | 0.3 |
| Vertigo | 1 | 0.3 |
| Others | 3 | 1 |
| Confirmed diagnosis | | |
| CVD | 168 | 54 |
| HIV/AIDS associated neurologic disorders | 28 | 9 |
| Meningitis | 27 | 8.7 |
| Seizure | 24 | 7.7 |
| Spinal cord disorders | 16 | 5.1 |
| Encephalopathy | 13 | 4.2 |
| GBS | 11 | 3.5 |
| Brain abscess | 7 | 2.3 |
| Tetanus | 4 | 1.3 |
| Cerebral malaria | 2 | 0.6 |
| Headache disorder | 1 | 0.3 |
| Others | 10 | 3.2 |

Morbidity pattern of neurologic emergencies

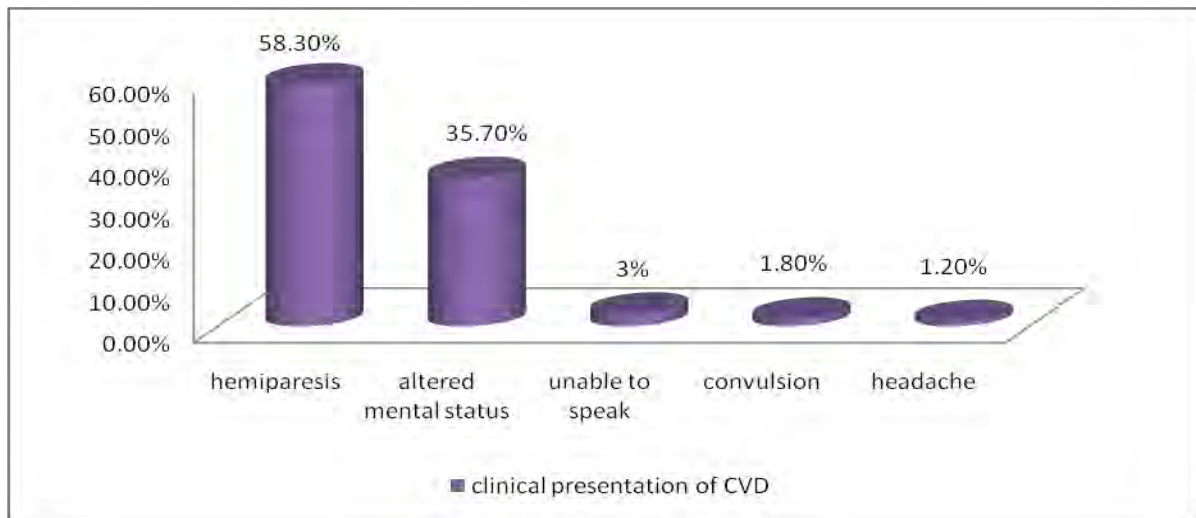
In this study majority of patients were due to CVD 54% followed by neurologic complication of HIV/AIDS 9%, meningitis 8.7%, and seizure disorder 7.7%. The morbidity distribution is presented in table 2.

The morbidity pattern showed that CVD was the most common diagnosis it was identified in 168 (54%) patients; 93 (55.4%) of these patients were male, and 75(44.6%) were females; the mean age was 53.7±1.4 years of age with mean age for men was 55 years, and 52 years for women, 66.67% (112) of the cases were age greater than 40 years.

From all CVD cases, 90 (53.6%) cases were due to ischemic stroke, 76 (45.2%) were due to hemorrhagic stroke and 2 (1.2%) were due to subarachnoid hemorrhage. 59% of patients with CVD had known medical illness 66% of those were known hypertensive patients, 20% of them had CRVHD and 6% were DM & Hypertensive patients. Ischemic stroke was common in males 48(53.3%) than females 42(46.7%) and the mean age of the patients was 55.3±3.9 years with median age of 60 years. 60(66.7%) of patients with ischemic stroke had known medical illness, and hypertension constituted 34(56.7%) of the medical illness followed by CRVHD observed in 22(36.6%) of the cases. similar to ischemic stroke, hemorrhagic stroke was common in males 44(57.9%) than females 32(42.1%) and the mean age of the patients with hemorrhagic stroke was 52.2±3.8 years with median age of 50 years.

The mean duration of presentation of CVD to ED was 3 days and the common presenting feature of ischemic stroke was hemiparesis observed in 56(62.2%) of the patients followed by altered mental status 27(30%), unable to speak 5(5.6%) and convulsion 2(2.2%). See figure 1 for CVD presenting features. The mean duration of illness while presenting to ED of hemorrhagic stroke was 3 days and the presenting features were hemiparesis 42(55.3%), altered mental status 32(42.1%), convulsion 1(1.3%) and headache 1(1.3%). Most of the patients with hemorrhagic stroke 40(52.6%) had known medical illness, hypertension constituted 39(97.5%) of the medical illness and diabetic mellitus constituted 1(2.5%). Disposition and outcome of CVD are presented in figure 5 and figure 6.

Figure 1:- Presenting features of patients with cerebrovascular disorders evaluated in ED of TASH from February 1, 2013 to January 31, 2014



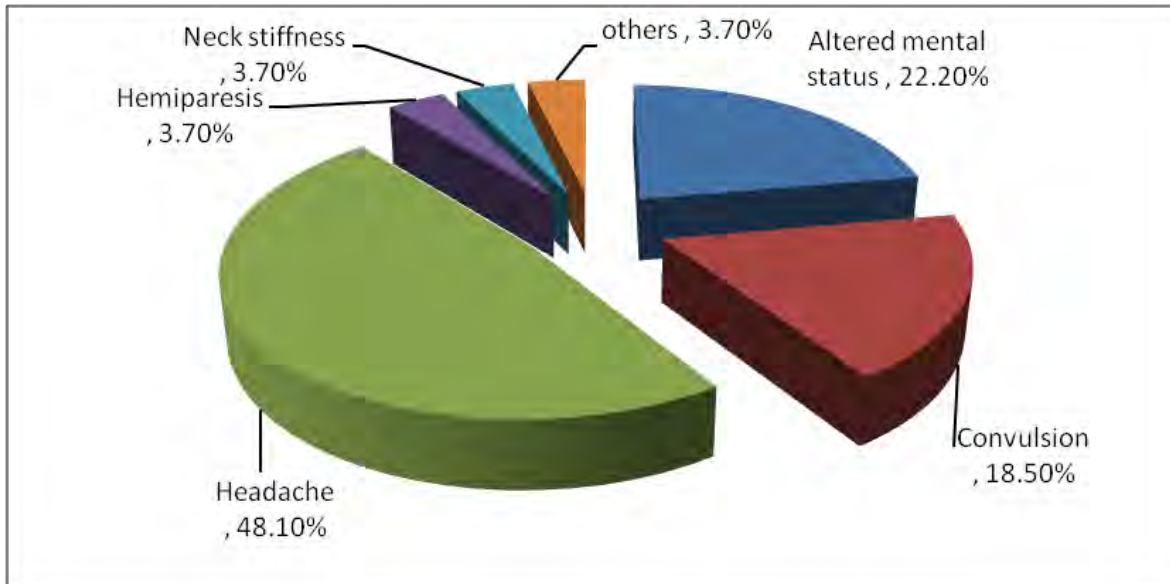
The second most common neurologic emergency identified in ED was neurologic complications of HIV/AIDS, which presented in 28 (9%) patients; the mean age of the patients was 36.6±2.1 years old with 15 (53.6%) patients being male. the mean duration of symptoms while presenting to ED was 15.7±3.7 days (range 1-90). The major HIV/AIDS associated neurologic disorders were CNS Toxoplasmosis 12(42.9%), TB Meningitis 7(25%), and Cryptococcal Meningitis 3(10.7%) and others as indicated in Table 3. The common clinical complaint during presentation to ED was altered mental status 32.2% followed by headache 25% and others as presented in table 3. Disposition and outcome of HIV/AIDS associated neurologic complications are presented in figure 5 and figure 6.

Table 3. Presenting features and morbidity distribution of neurologic complications of HIV/AIDS evaluated in ED of TASH from February 1, 2013 to January 31, 2014

| Clinical profile | Number | Percent |
|----------------------------|--------|---------|
| Presenting feature (n=28) | | |
| Altered mental status | 9 | 32.2 |
| Headache | 7 | 25 |
| Hemiparesis | 6 | 21.4 |
| Paraplegia | 3 | 10.7 |
| Convulsion | 2 | 7.1 |
| Loss of sensation | 1 | 3.6 |
| Confirmed diagnosis (n=28) | | |
| CNS Toxoplasmosis | 12 | 42.9 |
| TB meningitis | 7 | 25 |
| Cryptococcal meningitis | 3 | 10.7 |
| HIV Myelopathy | 2 | 7.1 |
| Primary CNS lymphoma | 2 | 7.1 |
| Polyneuropathy | 1 | 3.6 |
| Others | 1 | 3.6 |

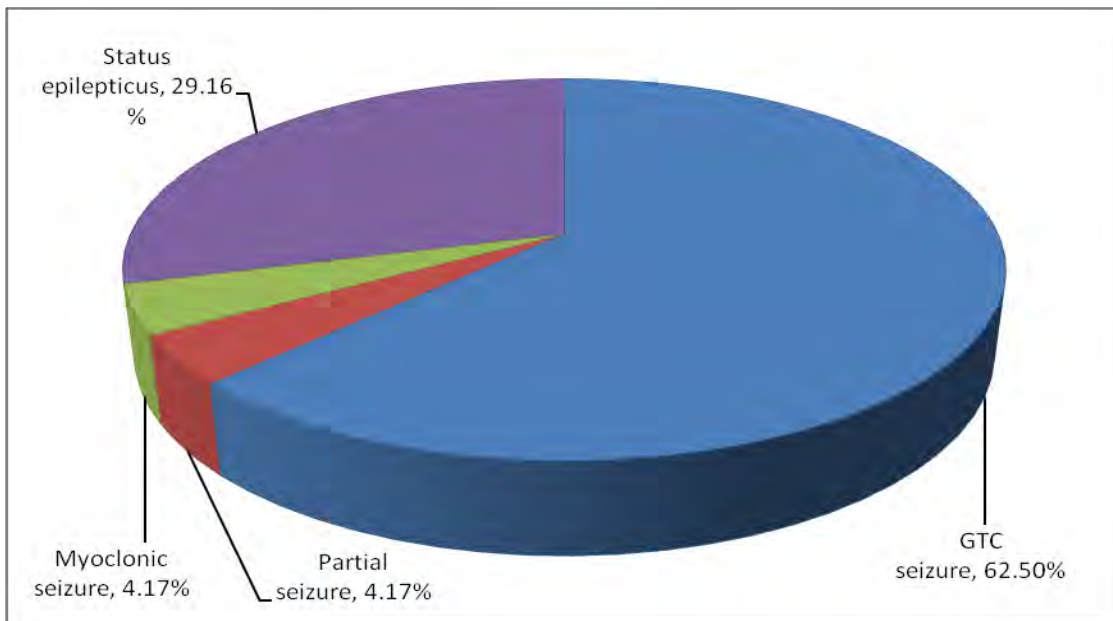
Meningitis 27(8.7%) was the third common neurologic emergency identified in ED of TASH. The mean age of the patients was 26.9± 2.3 years (range 14-62) with 89% of them < 37 years old and 66.7% were males giving a sex ratio (M: F) of 2:1. 17 (63%) of them came from Addis Ababa followed by Oromia 8(29.6%), SNNP 1(3.7%) and Amhara 1(3.7%) and the mean duration of symptoms during presentation to ED was 5.5 ± 1.2days (range from 4 hours -30 days). Headache 48.1% was the frequent clinical presentation followed by others presented in figure 2. Acute meningitis constitutes 70.4 %(19) of the cases, sub acute meningitis accounted 25.9 % (7) and chronic meningitis was 3.7 %(1).

Figure 2. Clinical presentation of patients with meningitis evaluated in ED of TASH from February 1, 2013 to January 31, 2014



Seizure disorder accounted 7.7 % (24) of neurologic emergencies with male dominance 58.3 %. The mean age of the patients was 31.2 years old and they were presented by convulsion 91.7% of the patients followed by altered mental status 8.3% with mean duration of illness during the presentation was 3.4 ± 1.7 days. 62.5% of the patients have known medical illness from them 86.7% had epilepsy. Figure 3 shows the type of seizures observed.

Figure 3. Seizure disorder distribution of patients in ED of TASH from February 1, 2013 to January 31, 2014



Cerebral malaria (0.6%) and headache disorder (0.35%) were uncommon.

From all neurologic emergencies 164(52.7%) had known medical illness, hypertension accounted 69(42.1%) of the medical illness, followed by HIV/AIDS and CRVHD accounted 32(19.5%) and 20(12.2%) respectively. Other medical illness associated with neurologic emergencies are listed in table 4

Table 4. Distribution of comorbidity of patients with neurologic emergencies evaluated in ED of TASH from February 1, 2013 to January 31, 2014

| Comorbidity | Male(f) | Female(f) | Total (f) | Percent |
|-------------------------|---------|-----------|-----------|---------|
| Hypertension only | 38 | 31 | 69 | 42.10% |
| HIV/AIDS only | 18 | 14 | 32 | 19.50% |
| CRVHD | 9 | 11 | 20 | 12.20% |
| Epilepsy | 11 | 4 | 15 | 9.10% |
| CLD | 3 | 5 | 8 | 4.90% |
| DM and Hypertension | 5 | 2 | 7 | 4.30% |
| DM only | 3 | 3 | 6 | 3.60% |
| Malignancy | 1 | 4 | 5 | 3.00% |
| Hypertension & HIV/AIDS | 0 | 1 | 1 | 0.60% |
| DM & HIV/AIDS | 1 | 0 | 1 | 0.60% |
| Total | 164 | 164 | 164 | 100.00% |

Disposition and Outcome of neurologic emergencies

After evaluation and management of neurologic emergencies in ED 53.7% (167) of them were admitted to ward, 24.4%(76) were discharged from ED, 6.1% (19) were referred to other hospital, 4.5% (14) were admitted to MICU and the rest 11.3% (35) of all neurologic emergencies evaluated in ED were died in the emergency unit.

From this study the mean days of hospitalization of neurologic emergencies in TASH was 9.8 ± 0.6 days range from 1 day to 64 days with longer hospitalization days for neurologic complications of HIV/AIDS with mean length of stay 18.4 ± 2.9 days followed by mean day of hospitalization 16.3 ± 5.7 for brain abscess. See table 5 for more information

Table 5. Mean hospitalization days of patients with neurologic emergencies evaluated in ED of TASH from February 1, 2013 to January 31, 2014

| Morbidity | CI of Mean duration of hospitalization in days |
|--------------------------------------|--|
| Neurologic complications of HIV/AIDS | 15.5 – 21.3 |
| Brain abscess | 10.6 – 22 |
| GBS | 8.3 – 15.7 |
| CVD | 8.4 – 9.8 |
| Tetanus | 1.8 – 15.8 |
| Meningitis | 6.5 – 8.7 |
| seizure disorder | 3.2 – 6 |
| Encephalopathy | 3.3 – 5.1 |

48.6% (151) of the neurologic emergencies evaluated in ED improved after management in TASH but 22.5% of the neurologic emergencies discharged or referred in the same clinical condition and 1.6% deteriorated. The overall mortality rate of neurologic emergencies was 27.3% (85) with 41.2% (35) of the 85 deaths occurred in ED with in mean length of stay in ED of 2.1 ± 0.28 days range from less than 1 day to 8 days, 49.4% (42) of the deaths happened in patients who were disposed to ward with mean length of stay 9.1 ± 1.3 days range from 1 - 37 days and 9.4%(8) of the deaths were in MICU. CVD was the most common cause of death observed in this study accounted 54.1% (46) with higher mortality from hemorrhagic stroke 54.3% (25) than ischemic stroke 45.7% (21). The second common cause of death was due to neurologic complications of HIV/AIDS 12.9% (11) followed by meningitis 11.8% (10). There were 3.5% (3) deaths reported due to seizure disorder all of them from status epilepticus. Other causes of death due to neurologic emergencies are listed in table 6.

Encephalopathy recorded the highest case fatality rate of 53.8% (7) followed by Tetanus 50% even they were just two cases, neurologic complications of HIV/AIDS 39.3% (11), meningitis 37%(10) with more case fatality of sub acute meningitis 71.4%(5) than acute meningitis 26.3%(5), the case fatality of CVD was 27.4% (46) with higher case fatality for hemorrhagic stroke 32.9% than ischemic stroke 23.1% and the case fatality of other disorders is presented In figure 4

The case fatality rate of stroke in male patients was 32.3% and in females it was 23.1%

Table 6. Mortality distribution of patients with neurologic emergencies evaluated in ED of TASH from February 1, 2013 to January 31, 2014

| Morbidity | Frequency | Percent |
|--|-----------|---------|
| Brain abscess | 2 | 2.4% |
| CVD | 46 | 54.1% |
| Ischemic stroke | 21 | 54.3% |
| Hemorrhagic stroke | 25 | 45.7% |
| Encephalopathy | 7 | 8.2% |
| Seizure | 3 | 3.5% |
| Status epilepticus | 3 | 100% |
| HIV/AIDS associated neurologic disorders | 11 | 12.9% |
| CNS Toxoplasmosis | 6 | 54.5% |
| Cryptococcal meningitis | 1 | 9.1% |
| Primary CNS lymphoma | 1 | 9.1% |
| TB meningitis | 3 | 27.3% |
| Meningitis | 10 | 11.8% |
| Acute meningitis | 5 | 50% |
| Sub acute meningitis | 5 | 50% |
| Spinal cord disorders | 3 | 3.5% |
| Tetanus | 2 | 2.4% |
| Others | 1 | 1.2% |
| Total | 85 | 100.0% |

After evaluation and management of meningitis in ED majority of the patients 55.6 % (15) were admitted to ward followed by 22.2 % (6) discharged to their home, 11.1 % (3) died in the emergency unit, 7.4% (2) referred to another hospital and the rest 3.7% (1) was admitted to MICU. The outcome of meningitis after management in TASH was 59.3% (16) patients improved, 37% (10) were died and 3.7% (1) discharged with the same clinical condition. And when we see the disposition of seizure disorder from ED after management 58.3% (14) were discharged to their home, 25.0% (6) admitted to ward, 8.3% (2) admitted to MICU, 4.2%(1) referred to other hospital and 4.2%(1) died in the emergency unit. 87.5% (21) of patients with seizure disorder improved see figure 5.7 for more information

Figure 4. Case fatality of neurologic emergencies evaluated in ED of TASH from February 1, 2013 to January 31, 2014

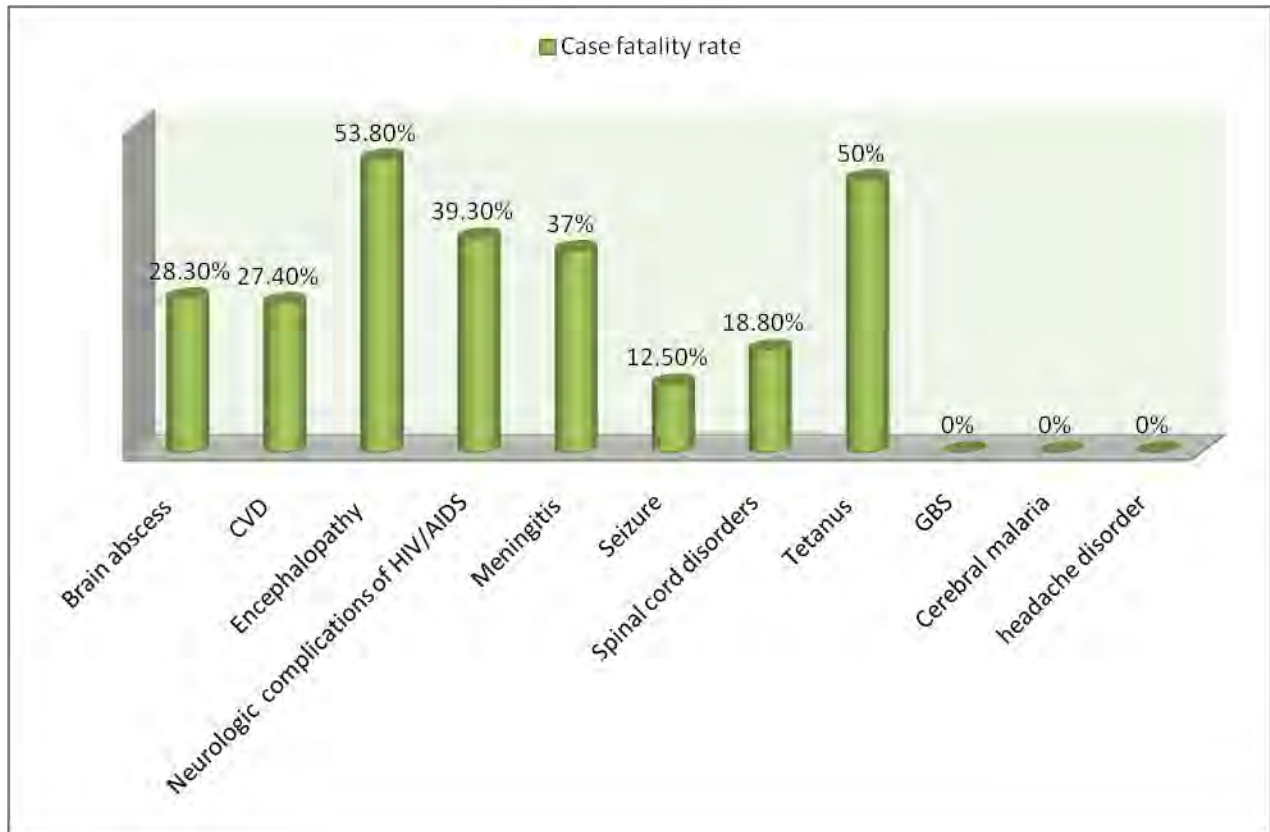


Figure 5. Disposition of patients with neurologic complications of HIV/AIDS and CVD evaluated in ED of TASH from February 1, 2013 to January 31, 2014

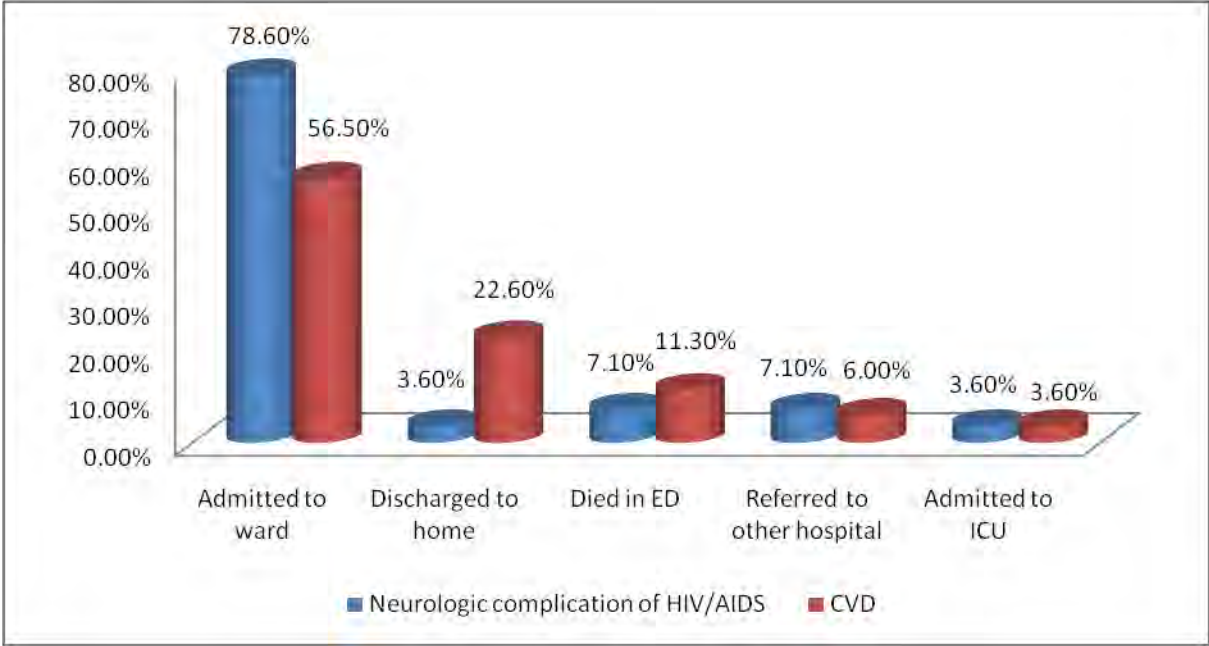
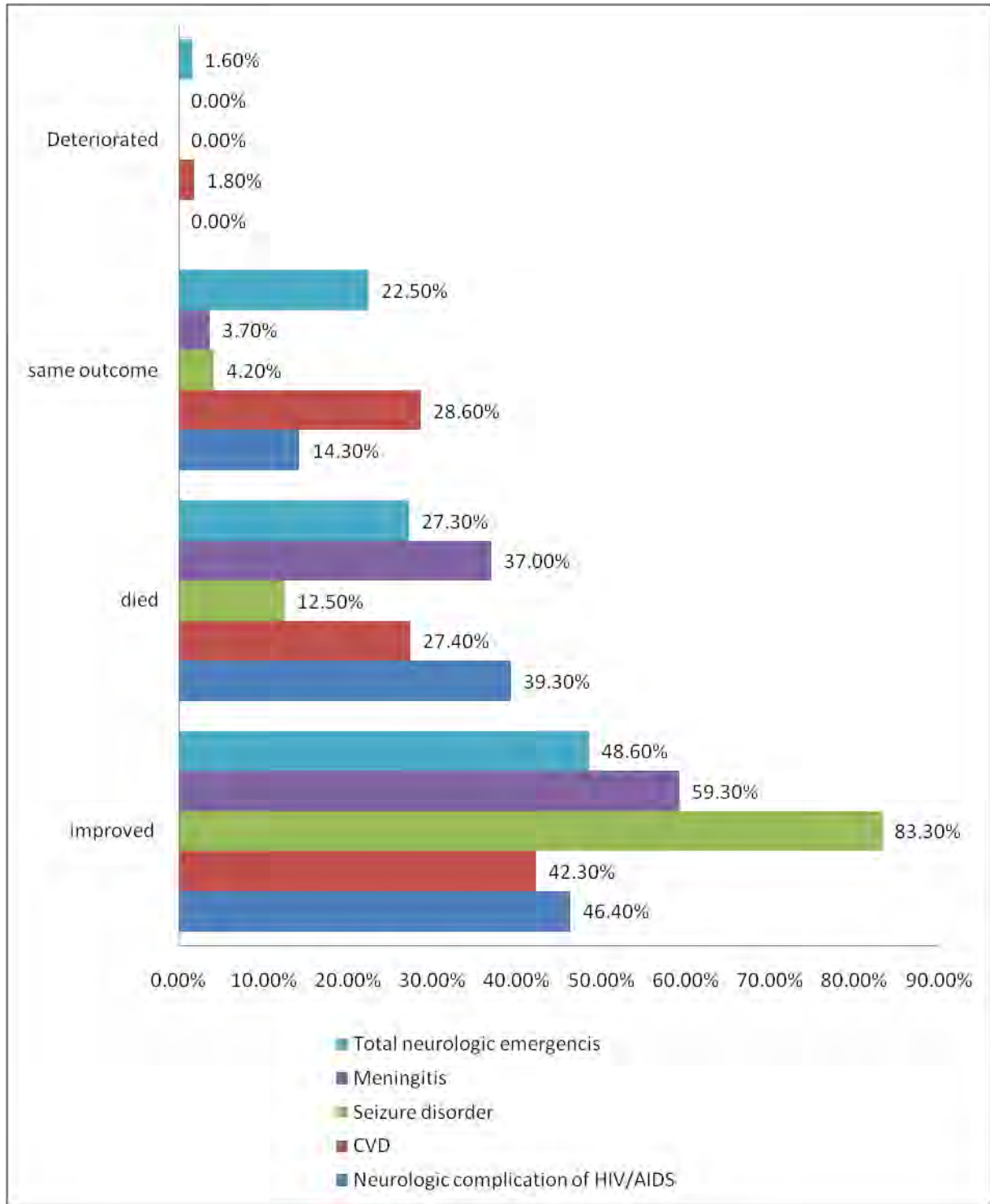


Figure 6. Outcome of patients with neurologic emergencies after management in TASH from February 1, 2013 to January 31, 2014



6) Discussion

This study has demonstrated that neurological emergencies accounted for 5.27% of the total medical emergencies seen in ED of TASH during the study period. This figure was lower than that reported in Nigeria where neurologic emergencies accounted for 25.7% of medical emergencies⁽⁷⁾ and in France where neurological emergencies were observed to account for 15% of the medical emergencies⁽¹⁵⁾. The magnitude of neurologic emergencies in this study is also lower than the magnitude of neurological disease seen in Ethiopian patient's hospitalized in general medical wards in two hospitals in Addis Ababa which made up 18.0% and 24.7 % of all medical admissions⁽¹¹⁾. The low rate could be from poor awareness of the public on neurologic disorders; still a lot of peoples in Ethiopia believe neurologic disorders are treatable only by holly water or spiritual power than proper medical management and follow up in hospitals.

The mean age of the patients with neurological emergencies was 44.68 ± 1.1 years. Though this was lower than the studies in Nigeria, Spain and France had reported the mean age of those with neurological emergencies to be 49.76, 59 years and 56.9 ± 21 years respectively^(7,16,15), It was also higher than the study done in India, the mean age of those with neurologic emergencies was 37.4 ± 19 ⁽²²⁾. The discrepancy may be it was due to socio demographic differences. In this study males outnumbered females, this agrees with a study carried out in Nigeria and India they also observed a male predominance of 56.7% and 63% among those with neurological emergencies^(7,22). In previous studies it is thought that the hormonal differences especially estrogen may be protective to the women.

The main complaint for neurologic emergency visit was hemiparesis this was correlated with the study in Germany where the most common chief complaints for emergency visit were focal weakness⁽²¹⁾. In the same study from Germany headache was the second common presentation followed by, dizziness or vertigo and seizure⁽²¹⁾ however in this study altered mental status was the second common presentation followed by headache and convulsion. But in UK Headache was the frequent presentation to ED followed by loss of consciousness, balance difficulties and power loss⁽⁴⁾ this difference could be from setting and time variation between the studies.

The most common neurologic emergencies in this study were CVD, neurologic complications of HIV/AIDS, meningitis and seizure disorder. The finding indicated an epidemiological transition of morbidity pattern in Ethiopia from communicable to non-

communicable diseases this has brought CVD to the forefront of the neurologic disorders. Compared to study done in Nigeria the three most frequent neurologic emergencies were stroke, Meningitis, and hypertensive encephalopathy⁽⁷⁾. In similar study in Spain it was found that Stroke, headache and epilepsy were the most common disorders seen in ED⁽¹⁶⁾. But in India the most common neurologic emergency was seizure disorder which accounted 51.5% followed by stroke which was 24% of the neurologic emergencies⁽²²⁾.

From this study the mean days of hospitalization of neurologic emergencies in TASH starting from they presented to ED until they discharged from TASH or died in TASH was 9.8 ± 0.6 days with longer hospitalization days for neurologic complications of HIV/AIDS with mean length of stay 18.4 ± 2.9 days followed by mean day of hospitalization 16.3 ± 5.7 days for brain abscess. This is lower than the study conducted in northwest Nigeria where length of hospitalization of neurologic disorders was 25 days⁽³³⁾.

After evaluation and management of neurologic emergencies more than half of them 53.7% were admitted to ward, 23.8% were discharged to their home and the overall mortality rate of neurologic emergencies was 27.3%, 49.4% of the deaths happened in patients who were admitted to ward with mean length of stay 9.1 ± 1.3 and 9.4% of the deaths were in MICU which was 57.1% of neurologic emergencies admitted to MICU during the study period this is consistent with the study from ICU in Nigeria where the overall mortality rate of neurologic disorders was high 52.4%. 11.3% of all neurologic emergencies evaluated in ED were died in the emergency unit with two days mean day of stay in TASH that was 41.2% of all the deaths due to neurologic emergencies in TASH. 48.6% of the neurologic emergencies evaluated in ED improved after management in TASH.

Cerebrovascular disorder was observed to be the most frequent neurologic condition evaluated in the emergency room, accounting for more than half of the total neurologic emergencies 54%. This was higher than the study done in Ethiopian patient's hospitalized in general medical wards in two hospitals in Addis Ababa where CVD accounted for 45% of the neurological diseases and it is consistent with study done in Nigeria it was identified in 52.5% of neurologic emergencies^(11,7). Majority of the cases were male patients this is similar to studies done in Sweden, Western Europe, Nigeria and Addis Ababa confirmed that stroke is more common among men than women^(18,17,12,7). The mean age of the patients with CVD was 53.7 years this is consistent with the study from Addis Ababa University Teaching hospital showed

the mean age of 53.2⁽¹²⁾ and this was lower than the demographically developed countries, where the average age at which stroke occurs is around 73 years reflecting the older age structure of these countries⁽¹⁴⁾. The mean age of male patients with CVD was higher than females 55 vs 52 years which was inconsistent and lower than the study from Western Europe where male patients were younger than female when they got their first stroke and the mean age for men was 68.6 years, and 72.9 years for women⁽¹⁸⁾. Ischemic stroke constitutes higher proportion 53.6% of the cerebrovascular accidents and it is followed by hemorrhagic stroke and subarachnoid hemorrhage it is not consistent with the Caucasian populations approximately 80% of all strokes are ischemic⁽¹⁴⁾ and it was contradictory with the findings from Addis Ababa university teaching hospital where hemorrhagic stroke was the most common cause of stroke accounting for 57% of all patients⁽¹²⁾. Similar to the study conduct in Addis Ababa University Teaching hospital Hypertension was the most frequent risk factor identified in this study followed by CRVHD, 66% and 20% respectively. 42.3% of all patients evaluated with CVD improved after management in TASH.

Cerebrovascular disorder was the most common cause of death observed in this study accounted 54.1% of the deaths with higher mortality from hemorrhagic stroke 54.3% than ischemic stroke 45.7% and the case fatality of CVD was 27.4% with higher case fatality from hemorrhagic stroke 32.9% than ischemic stroke 23.1%, In addition the case fatality of stroke in male patients 32.3% was higher than in females 23.1%. This result is in conflict with the study from Sweden where women had higher case fatality rate than men due to stroke⁽³⁴⁾.

Neurologic complications of HIV/AIDS were identified in 9% of neurologic emergencies, where males outnumbered females. This is conflicting with the study done in Ethiopia that showed both sexes were equally affected⁽³⁰⁾. Similar to the study from Ethiopia majority of the patients were young with mean age of 36.6±2.1 years with 82% of the patients age less than 45 years and the most common neurologic complications of HIV/AIDS were CNS Toxoplasmosis 42.9%, TB Meningitis 25%, and Cryptococcal Meningitis 10.7%⁽³⁰⁾. But in other study from Georgia tuberculosis meningitis were the most common neurological disorders 34%, followed by CNS toxoplasmosis 22% and cryptococcal meningitis 15%⁽³²⁾ identified in HIV/AIDS patients.

There was delay at presentation of neurologic emergencies with mean duration of symptoms prior to presentation was 15.7±3.7 days which was earlier than prior studies from Ethiopia⁽³⁰⁾.

The main complaints identified were headache, altered mental status, hemiparesis, and paraplegia. Similar to this study headache was the common clinical manifestations identified of neurological disorders in HIV infected patients in Georgia⁽³²⁾. After evaluation and management in ED 78.6% of the patients were admitted to ward, and the outcome of the neurologic complications of HIV/AIDS was poor similar to patients with CVD with only 46.4% improvement and 39.3% of all cases with neurologic complications of HIV/AIDS died this is lower than the study done in Ethiopia where case-fatality was 45%⁽³⁰⁾. Most of the deaths reported were from CNS Toxoplasmosis 54.5% followed by TB meningitis 27.3%.

In this study, meningitis ranked third common neurologic emergency but in study from Nigeria showed meningitis was the second common cause of neurologic emergency⁽⁷⁾. Meningitis also ranked the second frequent neurologic condition in Ethiopian patient's hospitalized in general medical wards in two hospitals in Addis Ababa⁽¹¹⁾. Majority of the patients were young and mean age of the patients was 26.9 ± 2.3 years with 89% of them < 37 years old. Like CVD and neurologic complications of HIV/AIDS males were dominant in patients evaluated as meningitis in ED of TASH giving M: F ratio of 2:1. Acute meningitis constitutes 70.4% and sub acute meningitis accounted 25.9 % of the meningitis cases. Headache 48.1%, altered mental status 22.2% and convulsion 18.5% were the common clinical presentations. 55.6% of those patients with meningitis admitted to ward for better management after evaluation and management in ED and 59.3% of patients with meningitis improved after evaluation and management in TASH but the case fatality rate of meningitis was higher 37% with more case fatality from sub acute meningitis 71.4% than acute meningitis 26.3% this could be due to late presentation to ED for sub acute meningitis.

Seizure disorders were also identified in 7.7% of the total neurologic emergencies this was the fourth common neurologic emergency in our setting but in France and Spain seizure disorder was the second and third common neurologic emergency respectively^(15, 16). In other study from Nigeria seizure disorder was not very common⁽⁷⁾. Most of the patients presented with convulsion 91.7% pursued by altered mental status 8.3% with mean duration of illness of 3.4 ± 1.7 days. The mean age of the patients was 31.2 years old and male dominance 58.3 % was observed in seizure disorder too. 87.5% of the seizure disorders improved after management in TASH but there were 3.5% of all neurologic emergencies deaths reported due to seizure disorder all of them from status epilepticus this gives 12.5% case fatality from seizure disorder.

Encephalopathy, GBS, brain abscess, tetanus, cerebral malaria and headache disorder were rare in this study. This was at variance to a study carried out in patients admitted for neurologic conditions to one hospital in Nigeria where tetanus was the second most common cause after stroke ⁽²⁷⁾. Even though encephalopathy and tetanus were rare cases but the highest case fatality rate was recorded 53.8% and 50% respectively. Even if the case fatality of tetanus in this study was high but it was lower than the study from Nigeria in ICU where the case fatality was 61.5% ⁽²⁹⁾. In this study there is no death reports recorded secondary to GBS, cerebral malaria and headache disorder.

In general Encephalopathy recorded the highest case fatality rate followed by Tetanus, neurologic complications of HIV/AIDS, meningitis and CVD respectively.

Limitations of the study

This study included patients evaluated in ED of a specialized, tertiary health institution, and the results was not representative to those treated at other facilities and the study was retrospective this could affect some results. The check list used to collect the data is not standardized which would have greatly enhanced the quality of this research. There was also a limitation in selecting of HIV/AIDS associated meningitis from any other meningitis.

7) Conclusion and recommendation

The pattern of neurologic emergencies in ED of TASH showed CVD, neurologic complications of HIV/AIDS, meningitis and seizure disorder are the most common diseases encountered while Encephalopathy, GBS, brain abscess, tetanus, cerebral malaria and headache disorder were rare. It also showed that causes of neurological morbidity are preventable and had high case fatality rates. The high fatality of neurologic emergencies can be decreased by early recognition and early treatment of neurologic disorders. Hypertension and HIV/AIDS were the two frequent co morbidities identified especially in patients with stroke and neurologic complication of HIV/AIDS so it is important to advice every patient with hypertension and HIV/AIDS to follow doctor's recommendations, to take all medications exactly as prescribed, and adopt healthy lifestyle. I also believe it will be very useful for health care policy makers if they focus on planning for better management and prevention of common neurologic emergencies and assist health education of the public to improve awareness on prevention modalities of stroke, seizure disorder and neurologic complication of HIV/AIDS. Improving awareness of the public will help them to bring patients with neurologic disorders as early as possible to near health care institution and this decreases mortality, disability and hospitalization days of neurologic disorders. I also recommend further study in this subject area.

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9) Annex: - Data abstraction format for retrospective study on pattern of neurologic emergencies in TASH, emergency department Addis Ababa, Ethiopia

| | | | | |
|----|---|--|----------------------------------|--|
| 1 | MRN | | | |
| 2 | Age in years | | | |
| 3 | Gender | <input type="checkbox"/> male | <input type="checkbox"/> female | |
| 4 | Residence | <input type="checkbox"/> Addis Ababa | <input type="checkbox"/> Tigray | <input type="checkbox"/> Afar |
| | | <input type="checkbox"/> Oromia | <input type="checkbox"/> Somalia | <input type="checkbox"/> SNNP |
| | | <input type="checkbox"/> Amhara | <input type="checkbox"/> Gambela | <input type="checkbox"/> Harare |
| | | <input type="checkbox"/> Benshangul gumuze | | <input type="checkbox"/> Diredawa |
| 5 | Clinical presentation to ED | <input type="checkbox"/> Altered mental status | | <input type="checkbox"/> Convulsion |
| | | <input type="checkbox"/> Speech difficulty | | <input type="checkbox"/> Loss of sensation |
| | | <input type="checkbox"/> Headache | | <input type="checkbox"/> Loss of memory |
| | | <input type="checkbox"/> Hemiparesis | | <input type="checkbox"/> Vertigo |
| | | <input type="checkbox"/> Paraplegia | | <input type="checkbox"/> Neck stiffness |
| | | <input type="checkbox"/> Quadriplegia | | <input type="checkbox"/> Other :-Specify_____ |
| | | <input type="checkbox"/> Trismus (lockjaw) | | |
| 6 | Duration of illness during presentation to ED in days | | | |
| 7 | Confirmed Diagnosis | <input type="checkbox"/> Cerebrovascular disease | | <input type="checkbox"/> Seizure disorder |
| | | <input type="checkbox"/> GBS | | <input type="checkbox"/> Meningitis |
| | | <input type="checkbox"/> Encephalitis | | <input type="checkbox"/> Tetanus |
| | | <input type="checkbox"/> Brian abscess | | <input type="checkbox"/> Headache disorder |
| | | <input type="checkbox"/> HIV associated neurologic disorders | | <input type="checkbox"/> Maysthsia gravis |
| | | <input type="checkbox"/> Cerebral malaria | | <input type="checkbox"/> Encephalopathy |
| | | <input type="checkbox"/> Spinal cord disorders | | <input type="checkbox"/> Others:- specify_____ |
| 8 | If no. 7 is Meningitis | <input type="checkbox"/> Acute Meningitis | | <input type="checkbox"/> Chronic Meningitis |
| | | <input type="checkbox"/> Sub acute Meningitis | | |
| 9 | If no. 7 is Seizure disorder | <input type="checkbox"/> GTC Seizure | | <input type="checkbox"/> Tonic Seizure |
| | | <input type="checkbox"/> Partial Seizure | | <input type="checkbox"/> Status epilepticus |
| | | <input type="checkbox"/> Myoclonic Seizure | | <input type="checkbox"/> Other :- specify_____ |
| 10 | If no. 7 is Cerebrovascular disease | <input type="checkbox"/> TIA | | <input type="checkbox"/> Hemorrhagic stroke |
| | | <input type="checkbox"/> Ischemic stroke | | <input type="checkbox"/> Subarachnoid hemorrhage |

| | | | |
|----|---|---|--|
| 11 | If no. 7 is Headache disorder | <input type="checkbox"/> Tension headache | <input type="checkbox"/> Migraine headache |
| | | <input type="checkbox"/> Cluster headache | <input type="checkbox"/> Other:- specify |
| 12 | If no. 7 is HIV associated neurologic disorders | <input type="checkbox"/> CNS toxoplasmosis | <input type="checkbox"/> Cryptococcal Meningitis |
| | | <input type="checkbox"/> HIV Encephalopathy (AIDS dementia complex) | <input type="checkbox"/> Cytomegalovirus Encephalitis |
| | | <input type="checkbox"/> Myopathy | <input type="checkbox"/> Polyneuropathy |
| | | <input type="checkbox"/> Tb meningitis | <input type="checkbox"/> Primary central nervous system lymphoma |
| | | <input type="checkbox"/> HIV Myelopathy | <input type="checkbox"/> Others:- specify |
| 13 | Co morbidity | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 14 | If no. 13 is yes what is the disease | <input type="checkbox"/> Hypertension | <input type="checkbox"/> DM |
| | | <input type="checkbox"/> HIV/AIDS | <input type="checkbox"/> Malignancy |
| | | <input type="checkbox"/> Epilepsy | <input type="checkbox"/> Others : - specify __ |
| 15 | Length of stay in TASH in days | | |
| 16 | Disposition | <input type="checkbox"/> Admitted to ward | <input type="checkbox"/> Referred to other hospital |
| | | <input type="checkbox"/> Admitted to ICU | <input type="checkbox"/> Discharged to home |
| | | <input type="checkbox"/> Sent to neurologic clinic for follow up | <input type="checkbox"/> Expired in ED |
| 17 | Outcome after management in TASH | <input type="checkbox"/> Improved | <input type="checkbox"/> Same |
| | | <input type="checkbox"/> Worsened | <input type="checkbox"/> Dead |

Declaration

I the undersigned declare that the thesis is my original work has not been presented for a degree in any other university and that all sources of materials used for the thesis have been duly acknowledged

Name of the candidate _____ signature _____

Advisors

1) _____ signature _____

2) _____ sig