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ORIGINAL ARTICLE

SPECTRUM OF NEUROLOGICAL DISORDERS IN ADULT NEUROLOGY SERVICE AT ZEWDITU MEMORIAL HOSPITAL ADDIS ABABA, ETHIOPIA

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ABSTRACT

Background: *Neurologic disorders are becoming an increasing threat to public health in developing countries and present special challenges in sub-Saharan Africa with its poorly developed medical infrastructure. Moreover, the burden of illness and the neurologic patterns are not well documented in those countries including Ethiopia.*
Objective: *To assess the spectrum of inpatient and outpatient neurological disorders at Zewditu Memorial Hospital in Addis Ababa, Ethiopia.*
Methods: *A retrospective cross-sectional survey was carried out at neurology health care facilities of the Department of Neurology at Zewditu Memorial Hospital in Addis Ababa, Ethiopia. We reviewed medical records of new outpatients seen at the adult neurology clinic, and those admitted for a primary neurologic illness at the hospital for the 3 year period between 2009 and 2012. Central tendency, measures of dispersion, frequencies and percentages were calculated using SPSS Version 19 statistical software and tabulations of the neurologic disorders were made.*
Results: *A total of 222 inpatients and 1,285 new outpatients were included during the study period. The most common diagnostic category amongst outpatients was neuropathy/radiculopathy/low back pain which accounted for 724(56.3%). Others were movement disorders 119(9.3%), seizure/epilepsy 94(7.3%), headache/cephalalgia 73 (5.7%) and cerebrovascular disease 56(4.4%). Amongst inpatients cerebrovascular diseases accounted for 97 (43.7%) cases, meningitis/meningoencephalitis 37(16.7%), intracranial space occupying diseases 32(14.4%), coma/encephalopathy 21(9.5%) and myelopathy and seizure/epilepsy in 6(2.7%) patients each.*
Conclusion: *Differences in the pattern of neurological disorders among outpatients and inpatients was seen.*

Key words: *Neurologic disorders, Ethiopia*

INTRODUCTION

The economic, social and personal burdens of the most common neurologic disorders in the United States and other developed countries have been the subject of intense study by neurologists but the enormous impact of neurologic diseases in the developing world is less known (1). A review of articles on the burden of neurologic diseases worldwide in 1996 revealed that diseases or events primarily or commonly affecting the nervous system are prominent among the top 10 causes of DALYs (disability adjusted life years) lost in both children and adults (1).

A study in Singapore showed that the spectrum of neurologic illness seen in outpatient practice was different from that of inpatient settings. The five most common neurologic disorders seen in outpatient practices in Singapore were headache and facial pain (24.5%), cerebrovascular diseases (17.3%), seizure disorders (17.3%), neuromuscular disorders (10.4%), and movement disorders (7.5%) (2).

Neurologic and psychiatric disorders are plentiful and are an increasing threat to public health in all developing countries. They present special challenges in sub-Saharan Africa with its poorly developed medical infrastructure (3, 4).

A cross sectional medical record review of outpatient neurologic consultations in the capital city of Camer-

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oon in 2015 revealed that of 912 patients, 187 (20.5%) were aged 60 years and above. ICD-10 Classification was used and episodic and paroxysmal disorders were found in 18.7%of patients, extrapyramidal and movement disorders in 14.6%, and nerve, nerve root and plexus disorders in 13.3%. The most common neurological diseases of the elderly in this study were lumbar arthosis (14%), dementia (Alzheimer's type, vascular) (12.4%), Parkinson diseases (10.2%) and polyneuropathy (9.1%) (5).

A retrospective period prevalence study of patients seen by a consulting neurologist in 2006 at the University Teaching Hospital in Zambia showed that infectious diseases were the most common cause of inpatient neurological illness while non-infectious neurological illnesses were most prominent among outpatients (6). In addition to the burden of infectious neurological diseases which have increased significantly due to the pandemic of HIV/AIDS, the upsurge of non-communicable diseases such as stroke due to lifestyle changes and the increasing prevalence of hypertension and diabetes mellitus, are quite alarming (2,7).

A community based survey of primary neurologic disorders in rural Ethiopia in 1990 on 60,820 people revealed a high prevalence of epilepsy 520/100,000, post poliomyelitis paralysis 240/100,000, leprosy 150/100,000, deaf mutism 130/100,000, hemiparesis 62/100,000, cerebral palsy 20/100,000, optic atrophy 16/100,000, tropical spastic paraparesis 10/100,000, Parkinson's disease 7/100,000 and MND/ataxia/ chorea and athethosis 5/100,000 (8).

The burden of inpatient neurologic diseases seen in two Ethiopian teaching hospitals in 2007 showed that neurologic cases made up 18.0% and 24.7% of all medical admissions in Addis Ababa and Gondar Hospitals, respectively. The mortality rates were 21.8% and 34.7%, non-infectious diseases accounted for 36.7% and 31.7% of neurologic cases in Addis Ababa and Gondar Hospitals, respectively. However, unknown etiologies made up 42.2% and 29.0% of all cases in these two hospitals, and of the total cases, only 42.9% and 24.1% had at least a high level of diagnostic certainty in the former and latter hospital, respectively (9).

Assessing the spectrum of neurological morbidities in a population is an important step for appropriate medical resource utilization and rational practice of clinical neurologic care. There is scarcity of studies conducted to describe the neurologic disease burden in Ethiopia even though a neurology residency training program has been started. The current training institute at Addis Ababa University was described as an excellent research center for both local and international researchers, especially for epidemiological studies. Having a research institute dealing with locally prevalent disease conditions has a great impact in devising disease prevention and treatment strategies relevant to the local setting. Thus this study aimed to assess the spectrum of inpatient and outpatient neurological disorders at Zewditu Memorial Hospital (ZMH) in Addis Ababa, Ethiopia from 2009 to 2012.

PATIENTS AND METHODS

A descriptive cross sectional survey was conducted at Zewditu Memorial Hospital, in Addis Ababa. We reviewed medical records of outpatients seen at the adult neurology clinic, and those admitted for a primary neurologic illness at the hospital over a span of three years, from 2009 to 2012. ZMH is one of the major teaching hospitals of the School of Medicine, College of Health Sciences of Addis Ababa University. It has outpatient specialty and subspecialty clinics in different fields of Medicine. Of these, the general neurology clinic, headache and movement disorder and seizure adult outpatient clinics convene three times a week and provide followup care in the range of 20-80, 4-10 and 6-10 patients per clinic session, respectively. The general neurology clinic is conducted by neurology attached internal medicine and neurology residents with one consultant neurologist and the subspecialty clinics are under the supervision of a consultant neurologist. There is also a large inpatient service that is divided into medical, surgical, pediatrics and obstetrics/gynecology (OB/GYN) wards. Admitted neurology patients have been evaluated by the ward general practitioner, internist and neurology resident.

Available laboratory investigations at ZMH included complete blood count, kidney and liver function tests, gram stain and acid-fast stain. Cerebrospinal fluid (CSF) studies include gram stain, cell count/ differential, total protein, and glucose. CSF culture, India ink stain, cryptococcal antigen, and PCR for detection of viral DNA were not available. Coagulation studies, serum electrolytes and bacterial, fungal, mycobacterium culture and sensitivity test were unavailable but patients were referred to other centers in the nearby area with the capacity to perform those tests. HIV testing was conducted following the national algorithm. CT scan, Magnetic Resonance Imaging (MRI) studies and electro diagnostic services (such as electroencephalography (EEG), electromyography (EMG) and nerve conduction studies (NCS) was available in other institutions for patients who could afford the cost.

Records of all new outpatients who were seen at the adult neurology clinic and inpatients who were admitted primarily for neurological disorders were retrieved from the log books. A total of 1,613 new outpatients and 317 inpatients were seen during the study period. At the outpatient setting 1,285 participants were included, but 37 cards could not be retrieved for different reasons such as change in labeling. At the inpatients setting, 222 were enrolled in the study and 13 records were excluded because they could not be located or were already included in the outpatient group.

Information collected from the records were patient history, physical examination, laboratory and ancillary tests results, follow-up and hospital course, outcome and final diagnoses. Patients' names were removed during data collection from the records and charts, and the ethical clearance was granted from the Institutional Review Board at the College of Health Sciences, Addis Ababa University and permission was granted by the Addis Ababa Regional Health Bureau.

Data were entered into Statistical Package for Social Science (SPSS package) version 19, descriptive statistics, including proportions and measures of central tendencies with dispersions, were calculated.

RESULTS

A total of 222 inpatients and 1,285 new outpatients which were seen during the study period were included in the study. The relevant demographic characteristics of the study population are presented in Table 1. The median age of patients in both outpatient and inpatient populations was 44 years (range between 14 to 90 years) and 45 years (range 15-90 years), respectively. Male to female ratio for outpatients and inpatients was similar (1:1.1 for each). About 92% of outpatients and 86% of inpatients were residents of Addis Ababa; 806 (62.7%) outpatients were referred from other government health setups while 99 (44.6%) of inpatients came from private referrals.

Table 1: Demographic Characteristics of Outpatient and Inpatient Study Subjects Attending Neurology Services at Zewditu Memorial Hospital in Addis Ababa, Ethiopia, between 2009 and 2012.

Characteristics	**Outpatient Frequency No (%)**	**Inpatient Frequency No (%)**	**Total No. (%)**
Sex:			
Female	660(85.2)	115(14.8)	775(51.4)
Male	625(85.4)	107(14.6)	732(48.6)
Address:			
Addis Ababa	1177(80.0)	191(20.0)	1368(90.8)
Other	108(78.0)	31(22.0)	139(9.2)
Source of Referral:			
Government	806(90.7)	83(9.3)	889(59.0)
Private	187(65.4)	99(34.6)	286(19.0)
Self	291(87.4)	42(12.6)	333(22)
Total	**1285(85.3)**	**222(14.7)**	**1507**

Table 2 shows diagnostic categories among the outpatient study population at Zewditu Memorial Hospital in Addis Ababa, Ethiopia, between 2009 and 2012 (using the Zambian neurological disorder categories, @ Siddiqi et al 2010). The most frequent diagnostic category was neuropathy/radiculopathy/low back pain observed in 724(56.3%) individuals. In addition movement disorders in 119 (9.3%), seizure/epilepsy in 94(7.3%), headache/cephalalgia in 73(5.7%), cerebrovascular disease in 56 (4.4%), cervical spondylosis in 43 (3.3%) and myelopathy in 36(2.8%) patients was observed.

Fifteen (1.2%) outpatients were in the category of "other" conditions which included cerebral palsy, mental retardation, pseudotumor cerebri, ankylosing spondylitis, vertigo, and neurofibromatosis and 26 (2.0%) were in the category of "unclear" diagnosis which included neurogenic claudication, hemi/mono/para paresis/plegia, non-specific pain, thalamic syndrome, communicating hydrocephalus, and thoracic disc degeneration.

Table 2: Neurological Disorders among Outpatient Study Subjects at Zewditu Memorial Hospital in Addis Ababa, Ethiopia, between 2009 and 2012 (using the Zambian neurological disorder categories, @Siddiqi et al 2010).

Diagnostic categories	**Frequency**	**Percent**
Neuropathy/radiculopathy/low back pain	724	56.3
Movement Disorders	119	9.3
Seizure/Epilepsy	94	7.3
Headache /Cephalalgia	73	5.7
Cerebrovascular diseases	56	4.4
Cervical Spondylosis	43	3.3
Myelopathy	36	2.8
Unclear diagnosis	26	2.0
Infectious Nervous Diseases	25	1.9
Trauma	18	1.4
Others conditions	15	1.2
Demyelinating Diseases	11	0.9
Dementia/Neurodegenerative Diseases	10	0.8
Neoplasm/Neoplastic Disorders	8	0.6
Post Herpes Zoster Neuralgia	6	0.5
Fibromyalgia/myalgia	7	0.5
Neuromuscular Disorders	6	0.5
Psychiatric Disorders	4	0.3
Spastic Para paresis	3	0.2
Encephalopathy/Coma	1	0.1
Total	**1285**	**100.0**

Neurological Disorders among Inpatient Study Subjects at Zewditu Memorial Hospital in Addis Ababa, Ethiopia, between 2009 and 2012 (using the Zambian neurological disorder categories, @ Siddiqi et al 2010). Among inpatients, cerebrovascular disease accounted for the largest 97(43.7%) number, followed by meningitis/ meningoencephalitis in 37 (16.7%), intracranial space occupying lesions in 32 (14.4%), coma/encephalopathy in 21 (9.5%), myelopathy in 6 (2.7%), seizure/epilepsy in 6 (2.7%), transverse myelitis in 5(2.3%), demyelinating disorders in 5 (2.3%), dementia/neurodegenerative disorder in 3(1.4%) and tuberculosis spondylitis in 3 (1.4%) cases. Three (1.4 %) patients with right hemi paresis were in the category of “unclear diagnosis”, and those with less than 1% representation were placed in the category of “other conditions” which included neuromuscular disorders, subdural hematoma, tetanus and pseudo tumor cerebri each represented once in this study. (Table 3)

Table 3: Neurological Disorders among Inpatient Study Subjects at Zewditu Memorial Hospital in Addis Ababa, Ethiopia, between 2009 and 2012 (using the Zambian neurological disorder categories, @Siddiqi et al 2010).

Diagnostic categories	Frequency	Percent
Cerebrovascular diseases	97	43.7
Meningitis/Meningioencephalitis	37	16.7
Intracranial space occupying lesions	32	14.4
Coma/Encephalopathy	21	9.5
Myelopathy	6	2.7
Seizure/Epilepsy	6	2.7
Transverse myelitis	5	2.3
Demyelinating Disorders	5	2.3
Other*	4	2.0
Dementia/Neurodegenerative	3	1.4
Tuberculous Spondylitis	3	1.4
Unclear diagnosis	3	1.4
Total	**222**	**100.0**

*Other: includes neuromuscular disorder, subdural hematoma, tetanus and pseudo tumor cerebri

DISCUSSION

For any medical disorder, one needs accurate data on incidence and prevalence to enable generalizations to broader populations and assess trends. Beyond incidence and prevalence, additional research is needed to allow a more complete estimate of burden of illness that includes potential years of life lost, productive years lost to disability, impact on caregivers and economic costs (10). This study attempted to assess outpatient and inpatient neurological disorders in a major urban setting, Addis Ababa, the capital city of Ethiopia.

The sex and age distribution of both outpatient and inpatient study subjects was similar. The median ages of inpatients and outpatients was also comparable but different from that seen in previous studies from Singapore and Zambia (2,6). This is due to differences in the average life expectancy of the Singapore population which was 76.5 years in 1994 (2) while that of Zambia was 43 years (median age of 39 years) (6). The majority of the outpatients and inpatients were from Addis Ababa, 1177(91.6%) and 191 (86%), respectively. This is due to the fact that ZMH, alongside of Black Lion hospital is one of the hospitals where neurology service is provided, following the introduction of neurology subspecialty training in Ethiopia in 2006 (7). For the outpatients, most (62.7%) came from referral government health setups while most (44.6%) inpatients were from private referrals. This is because for most of the acute conditions such as cerebrovascular disease or meningitis, people in Addis Ababa tend to go to the nearby private health setups.

The most common neurological disorder among the outpatient study subjects was neuropathy/ radiculopathy/low back pain, accounting for 56.3% of the total. This was different from the inpatient study subjects in which the most common neurological diagnosis was cerebrovascular disease, seen in 43.7% of cases. These findings were similar with findings reported from Singapore and Zambia where differences were observed in the nature of the neurological disorders affecting outpatient and inpatient populations. In those studies the most common inpatient neurological disorders were cerebrovascular disease and central nervous system infections (2,6). This could be because the neurological conditions noted most often in inpatients were of an acute or sub-acute nature (such as cerebrovascular disease), of the sort which required immediate medical intervention in order to safeguard the life of patients. This was seen in this study by the shorter duration of the symptoms in the inpatient group. Neurological problems observed in outpatients had a greater impact on morbidity rather than mortality, since cases presented with a longer duration period (months, several years) from the onset of their symptoms.

Movement disorders among the outpatient study subjects in the current study were found to be higher than what was observed in a previous study from Singapore in 1996 (2), but less than what was reported from a Zambian study in 2010 (6) and a Cameroonian study in 2015 (10.2%) although the latter was done specifically in the elderly (60 years and older) who comprised 20.5% (5).

Seizure/epilepsy cases constituted 7.3% among the outpatient study subjects in the present study, which was similar to a previous finding from Ethiopia in

2007 which reported a finding of 6.1% (9). However for Zambia, Cameroon and Singapore, seizure/ epilepsy cases accounted for a higher proportion of outpatient neurological disorders, 12.6%, 18.7% and 17.3% respectively(6,5,2). Meningitis/ Meningoencephalitis was the second most common neurological disorder among the inpatient study population which was similar to previous study done in Ethiopia in 2007(9). The inpatient study population showed intracranial space occupying lesion (ICSOL) as the third most common neurological disorder (14.4%) which was similar with findings from the same Zambian study which reported 15.2% (6). Finally headache/cephalalgia, cervical spondylosis and myelopathy were more common in the outpatient setting whereas coma/encephalopathy and infectious diseases were higher in the inpatient setting.

Patients were classified into a single diagnostic category based on their symptoms, exam findings, and testing. However, certain conditions arguably fitted into multiple diagnostic categories such as Coma, intracranial space occupying lesions, HIV dementia, demyelinating diseases or transverse myelitis. There are multiple limitations to this study. It was completed at only one institution that is a tertiary care center and does not represent the community or rural areas. Definitive diagnoses could rarely be established due to the lack of appropriate laboratory testing and equipment such as MRI, EEG, and EMG that is either too expensive to purchase or maintain. More importantly, there is likely a large amount of neurological disease that goes unrecognized because of a generalized lack of neurological expertise. This is a chart review where neurological findings and conditions can easily be missed by a non-neurologist. The hospital was on renovation during the first six months of the study period when no inpatient service was carried out. This could be another limitation of this study because of the missing inpatient population group during the study period.

With the advent of a new neurology residency program in 2006, a new neurological service was introduced to ZMH. This survey may help to improve the level of neurologic care provision in the hospital by structuring the neurology service care for these patients. Furthermore, it will help to create a blueprint for any future neurology service of a general hospital in Addis Ababa, Ethiopia. Despite the above mentioned limitations, numerous neurological disorders were diagnosed in this study, with a clear pattern of differences between outpatient and inpatient settings.

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