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The pattern and burden of neurological disorders: A systemic review of Neurology Department, Yangon General Hospital, Myanmar

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Abstract

Objective: To understand the pattern and burden of neurological disorders at Department of Neurology, Yangon General Hospital (YGH), Myanmar. *Method:* All patients admitted to Department of Neurology had been prospectively registered and then analyses were performed on one year data from 1st January to 31st December 2019. Results: Among study population of total 17606 cases, 65.5% attended to neurology out-patient clinics, 20.1% were seen as referral cases and 14.4% were inpatients at neurology ward. When analyzed the inpatients, 58% were male. Mean age was 47.2 ±19.1 years and 41-65 year age group was most commonly affected. The most common inpatient neurological diseases were cerebrovascular diseases (CVD)(40.8%), central nervous system (CNS) infections (15.2%) and peripheral nerve lesions (9.4%). Autoimmune diseases and headache disorders were more common in women. Mortality rate in inpatients was 4.6%, among which stroke occupied for 55.1% and CNS infection was 23.7%. Three most common neurological diseases in out-patient clinic were seizure disorders (21.9%), CVD (20.7%) and headache disorders (11.2%). Among the referral cases, 43.7% were CVD, 17.8% were CNS infections and 11% had seizures disorders. The most referred patients (93.3%) came from general medical wards.
Conclusions: Entire range of neurological disorders was present in YGH. CVD and CNS infections were the most common cause of incidence as well as the mortality. Knowing the burden can raise the awareness about it and point out the prioritizing provision of essential health services. As similar in controlling the communicable diseases, the importance of health education, preventive measures on non-communicable disorders should be considered as national concern.

Keywords: Neurological disorders, pattern, tertiary hospital

INTRODUCTION

Neurological diseases are posing a big challenge to country health because these can cause high mortality and morbidity. It is essential to know the pattern of neurological diseases in individual country for appropriate strategy in health care system. Myanmar (formerly Burma), with 676,578 square kilometers width and over 51.5 million population, is situated in Southeast Asia.[1] It has 14 states and divisions. Yangon division with 7.36 million population is located in lower Myanmar and Yangon city is the largest and commercial city of Myanmar.[2] Hospitals in Yangon are the most facilitated, among which Yangon General Hospital (YGH) is the biggest adult tertiary referral center as well as the university hospital with all subspecialties. There was only few data about the pattern and burden of neurological diseases at this tertiary center and Myanmar. Disease pattern may be varied due to different geographical, social, cultural, religious, and ethnic factors. The purpose of the study was to understand the pattern and burden of neurological diseases at Department of Neurology, Yangon General Hospital, Myanmar.

METHODS

This study was a hospital-based cross-sectional descriptive study consisting of all patients from neurology outpatient clinic and inpatient ward of Department of Neurology, YGH during a period

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from 1st January to 31st December, 2019. Data entry and analyses were done by Microsoft excel 2010. Categorical variables were summarized in proportions, and numerical variables were described in means (SD). Chi square test was used to assess the association between categorical variables. P value <0.05 was considered as statistically significant.

RESULTS

Yangon General Hospital is a 2000-bedded hospital, in which Department of Neurology occupied 75 inpatient beds. Our hospital is affiliated with the University of Medicine 1 and has 3-year Doctorate neurology course. There were 9 neurologists and 7 neurology residents in 2019.

During the study period of one year, total number of inpatients admitted to Department of Neurology was 2,540 (average admission rate was 211 patients per month). Among them, 60.87% were staying in Yangon division while the rest (39.13%) were from other states and divisions of Myanmar. Average number of inpatients in each day was 77.67 and percentage of occupancy was 97.09. Patient days was 28,351 and average duration of hospital stay was 11.16 days. Among study population, mean age was 47.2 ±19.1 years with the age range 12 to 96 years, majority (43.1%) was in 41-65 years age range group. The second most affected age group by neurological diseases among inpatients was 20-40 years group (28.6%), followed by >65 years group (20.8%) and the least affected was 12-19 year age group (9.1%). Of the study population, 58% were male and female was 42%. The most common neurological diseases among inpatients were cerebrovascular diseases (CVD) (40.8%), CNS infections (15.2%) and peripheral nerve lesions (9.4%). Among CVD, ischemic stroke constituted 87.3%, hemorrhagic stroke 2.8%, transient ischemic attack (TIA) 6.4% and cerebral venous sinus thrombosis (CVST) 3.6%. Among the second commonest CNS infections, 36% were central nervous system tuberculosis (CNS TB) cases and 33.9% were viral encephalitis. Pyogenic meningitis accounted for 7.3%, brain abscess 2.6%, fungus 1%, parasite 6.7% and unknown etiology in 12.4% among CNS infection cases. Guillain-Barre syndrome (GBS) held to be the commonest in the nerve lesions that caused high admission rate (44.5%). Cranial neuropathies constituted 33.2% among the nerve lesions. Among 64 CNS demyelinating cases, 90.6% were neuromyelitis optica spectrum disorders (NMOSD) and only few were multiple sclerosis (MS) and acute disseminated encephalomyelitis (ADEM). Of the patients with muscle disorders, 45.71% were myositis and 54.29% were muscular dystrophies. Table 1 showed distribution of various neurological diseases among different age groups and different genders. Overall mortality rate of neurology department in inpatients was 4.6%: in which stroke accounted for 55.1% and CNS infection accounted for 23.7%.

The frequency distribution of various neurological disorders among neurology ward inpatients, referral cases and neurology outpatient department (OPD) was shown in Table 2. A total of 11,531 out-patients, including both old and new patients, the most common disorder was seizure disorders (21.9%), stroke (20.7%) and headache disorders (11.2%). Among them, 80.77% attended general neurology outpatient clinics which run two days a week, 17.4% attended epilepsy clinic which run on every Friday and 1.82% visited memory clinic which opens every Monday. Among the 3535 referred cases, the most common reason for referral was CVD (43.7%), and then CNS infections (17.8%) and seizures disorders (11%). General Medical wards were the main referral department which was 93.3% among cases. Distribution of various specialties consulted to neurology ward in descending order is shown in Table 3.

Available diagnostic services for neurological diseases are blood tests for basic screening, electrocardiography (ECG), chest X-ray, spine X-ray, ultrasonography, carotid Doppler ultrasound, echocardiogram, computerized tomography (CT) scan, and magnetic resonance imaging (MRI). Neurophysiological tests which are done in neurology department of YGH are electroencephalography (EEG), nerve conduction study (NCS) and electromyography (EMG), autonomic function test (AFT), visual evoked potentials (VEP), somatosensory evoked potential (SSEP) and transcranial Doppler (TCD) ultrasound. Although some neurophysiology tests such as EEG, NCS, AFT, VEP and EMG are well-established, SSEP, TCD and neuromuscular ultrasound still need expertise. In 2019, neurophysiology laboratory has done total of 931 EEG, 541 NCS, 237 EMG, 20 AFT and 14 VEP.

Concerning with other special neurological management services, therapeutic plasma exchange was done in patients with neuroimmunological diseases with steroid failure or when steroids are not indicated. Total 193 patients received

Table 1: Distribution of various neurological conditions by gender and age groups

Inpatients	Male	Female	P	12-19 years	20-40 years	41-64 years	≥ 65 years
Cerebrovascular diseases	682	355	<0.001	10	155	534	339
CNS infections	230	156	0.50	88	146	99	53
Seizure disorders	72	44	0.37	20	51	31	14
Traumatic brain injuries	6	1	0.14	0	4	4	0
CNS Neoplasms	29	23	0.74	2	9	25	16
Alzheimer and other dementias	14	8	0.59	0	2	7	13
Parkinsonism	15	12	0.79	2	4	12	9
Other movement disorders	17	17	0.34	15	8	6	5
Systemic autoimmune	2	7	0.03	1	4	3	1
Autoimmune encephalitis	1	17	<0.001	9	8	1	0
Spinal cord disorders except demyelinating diseases	107	70	0.5	10	66	81	21
CNS demyelinating diseases	18	46	<0.001	6	43	15	0
Headache disorders	15	34	<0.001	7	17	23	2
GBS	67	39	0.27	25	41	34	6
Motor Neuron disease	8	9	0.36	0	2	12	3
Myasthenia Gravis	55	84	<0.001	4	55	63	17
Muscle disorders	13	22	0.01	4	16	14	1
Functional neurological disorders	4	17	<0.001	4	12	5	0

therapeutic plasma exchange during the study period.

Neurology team received 432 cases of acute stroke activation in 2019 for thrombolysis services, out of which only 17.36% could get thrombolysis therapy and the rest could not due to various reasons in which intracranial hemorrhage (ICH) was being the commonest reason. Mechanical thrombectomy service is not available until now in Myanmar.

DISCUSSION

Neurological disorders are the leading cause of disability adjusted life years (DALYs) and second leading cause of mortality globally.[3] According to Myanmar Ministry of Health's report on health care system in Myanmar (2014), stroke is one of the leading cause of mortality.[4] Although there were 2000 sanctioned beds for the whole YGH and 75 beds for neurology department, actual available beds were 2,021 and 80 respectively in 2019.[5] With population per neurologist of 2.21 million in Myanmar [6], neurological cases are mainly managed by general physicians. At Department of Neurology of YGH, patients per neurologist was 1956 in 2019. Even with high work load, neurology department could have contributed only 2.85% of total YGH admission and 2.22% of total OPD patients.[5] However, percentage of bed occupancy of neurology ward (97.09%) was higher than that of whole YGH (74.7%) and more patients were from outside Yangon region because nearly 40% of neurology ward admission were from that areas. This was because neurologists are accessible only at university hospitals at capitals currently. Compared to the previous years, neurology ward admission showed increasing trend with total inpatients 1561 in 2017, 1752 in 2018 and 2540 in 2019 while the number of total admission to YGH remained stable with 89776, 87636 and 89072 in each respectively.[5] It means that neurology ward has been trying to take over more cases in each year by increasing the bed availability. Cho and Tun in 2007 reported that total 3,888 outpatients and inpatients in the year 2004 at neurology ward, YGH[7] but the current study showed 14,071 total inpatients and outpatients, which is almost 4 times that of 2004's workload. High burden of workload reminds the need for recruitment of fresher neurologists. Average duration of hospital

Table 2: Frequency of various neurological disorders in inpatient basis, out-patient basis and inpatient referral basis

		Inpatients	Inpatient Referral	Outpatients
1	Cerebrovascular diseases	1037 (40.82%)	1546 (43.73%)	2392 (20.74%)
2	CNS infections	386 (15.19%)	630 (17.82%)	589 (5.11%)
3	Seizure disorders	116 (4.57%)	390 (11.03%)	2523 (21.88%)
4	Traumatic brain injuries	8 (0.32%)	16 (0.45%)	14 (0.12%)
5	CNS Neoplasms	52 (2.05%)	75 (2.12%)	54 (0.47%)
6	Alzheimer and other dementias	22 (0.87%)	22 (0.62%)	296 (2.57%)
7	Parkinsonism	27 (1.06%)	61 (1.73%)	481 (4.17%)
8	Hyperkinetic movement disorders	34 (1.34%)	59 (1.67%)	569 (4.94%)
9	Cerebellar ataxias and hereditary spastic paraplegias	7 (0.28%)	4 (0.11%)	6 (0.05%)
10	Systemic autoimmune diseases	9 (0.35%)	9 (0.26%)	13 (0.11%)
11	Autoimmune encephalitis	18 (0.71%)	1 (0.03%)	19 (0.17%)
12	Spinal cord disorders except demyelinating diseases	177 (6.97%)	260 (7.36%)	264 (2.29%)
13	CNS demyelinating diseases	64 (2.52%)	23 (0.65%)	211 (1.83%)
14	Headache disorders	49 (1.93%)	23 (0.65%)	1296 (11.24%)
15	Dizziness/vertigo/syncope	10 (0.39%)	18 (0.51%)	292 (2.53%)
16	Nerve lesions	238 (9.37%)	175 (4.95%)	687 (5.96%)
17	Root lesions/radiculopathy	14 (0.55%)	2 (0.06%)	67 (0.58%)
18	Motor neurone disease	17 (0.67%)	14 (0.40%)	39 (0.34%)
19	Myasthenia Gravis	139 (5.47%)	106 (2.99%)	1046 (9.07%)
20	Muscle disorders	37 (1.46%)	22 (0.62%)	57 (0.49%)
21	Encephalopathy including metabolic, toxic and hypoxic	16 (0.63%)	68 (1.92%)	17 (0.15%)
22	Functional neurological disorders	21 (0.83%)	4 (0.11%)	21 (0.18%)
23	Others	42 (1.65%)	7 (0.21%)	578 (5.01%)
	Total	2540 (100.0%)	3535 (100.0%)	11531 (100%)

CNS Central nervous system

Others: idiopathic intracranial hypertension (IIH), local eye disease, musculoskeletal problems, posterior reversible encephalopathy syndrome (PRES), sleep disorders, substance abuse, transient global amnesia (TGA), cardiac syncope, ENT problems, dysphagia due to local structural lesion, idiopathic orbital inflammatory syndrome (IOIS), heat stroke.

stay for inpatients was 11.16 days, which was nearly twice of average duration of hospital stay of whole YGH (6.68 days)[5], and it means that neurological diseases were needed to long hospital stay and care.

In this study, we found significant gender preferences in the prevalence of some neurological conditions. As expected, diseases that were seen significantly more in women were systemic autoimmune diseases, autoimmune encephalitis, CNS demyelinating diseases, headache disorders, myasthenia gravis, muscle disorders and functional neurological disorders, and CVD was found significantly more common in men (Table 2). Neuroimmunological diseases which include Guillain-Barre syndrome (GBS), CNS demyelinating, autoimmune encephalitis, myasthenia gravis, myositis and systemic autoimmune cases with neurological manifestations occupied 13.98% (355/2540) of total neurology ward admission and, as expected, they were found significantly more in females. Age range in this study was 12 to 96 years because YGH is an adult hospital accepting

Table 3: Distribution of various specialties consulting cases to Department of Neurology, YGH

General medical wards	3298 (93.3%)
General surgical wards	30 (0.9%)
Orthopaedics	29 (0.8%)
Nephrology	27 (0.8%)
Oncology	21 (0.6%)
Chest surgical	20 (0.6%)
Neurosurgery	19 (0.5%)
Physical and rehabilitation medicine	14 (0.4%)
Cardiac medical	13 (0.4%)
Rheumatology	12 (0.3%)
Haematology	11 (0.3%)
Cardiovascular surgery	8 (0.2%)
Hepatobiliary surgery	5 (0.1%)
Obstetrics and Gynaecology	5 (0.1%)
Urosurgical department	4 (0.1%)
Hepatology	3 (0.1%)
Respiratory medicine	2 (0.1%)
Dermatology	1 (0.1%)
Burn unit	1 (0.1%)
Outside hospitals	12 (0.32%)
Total	3535 (100%)

from the age of 12 years. The two most affected age groups were 41-65 years (43.1%) and 20-40 years (28.6%) groups, which means neurological conditions mainly affect the working age group. A study from Dhaka, Bangladesh, reported 59.7% of admissions in neurology were after the age of 40 years [8], which is more or less the same with the current study where 63.9% were after 40 years. Moreover, type of neurological diseases can vary with the age group: dementia was common in age group over 65-years, CVD, CNS neoplasms and parkinsonism were found more in 41-64 year age group, CNS infections, epilepsy and seizure disorders and CNS demyelinating diseases were more in 20-40 year age group, and headache and spinal cord disorders were common in 20-64 year group.

CVD, CNS infections and nerve lesions were the top three diseases among inpatients at neurology ward and CVD, CNS infections and seizures disorders were the top diseases for referred cases. Among outpatients, epilepsy and seizures disorders, CVD and headache disorders were the commonest reason to come OPD. The spectrum was basically the same compared to previous study done in 2004[7] where it was reported that stroke, headache and epilepsy were the three most common diseases among both inpatients and outpatients of neurology department, YGH. Interestingly, among the CNS demyelinating diseases, MS was quite rare and NMOSD was quite common compared to West and it supports the fact that the prevalence of MS is low in Orientals probably due to racial, genetic, environmental factors.

Since total stroke patients who were admitted to YGH during 2019 was 7396 [5], patients admitted to neurology ward accounted for 14% among them. Although there was many patients with neurological diseases at general medical wards, neurology ward could accept only 17.9% of all ischemic stroke patients admitted to YGH. Thrombolysis was done only on 8.3% of acute ischemic stroke patients admitted to neurology ward or 1.5% of total ischemic stroke patients attending to YGH. Most of the patients with acute ischemic stroke could not get thrombolysis because of late arrival to hospital which pointed the need for health education to improve public awareness and for set up the emergency ambulance

services, and it was also due to insufficient manpower and time limitation of thrombolysis service which can do only 12 hours in weekdays currently. Among all stroke cases admitted at YGH, about two-thirds (68.2%) was ischemic stroke and remaining one-third (31.8%) was hemorrhagic stroke whereas 87.3% of ischemic stroke patients and 2.8% of hemorrhagic stroke patients admitted to neurology ward and almost all hemorrhagic stroke cases were under care by neurosurgical team. Communicable diseases also accounted as the second most common neurological disease among inpatients. CVD and CNS infections ranked top of the mortality of neurology ward. In addition, according to the YGH annual report, stroke is the topmost of both morbidity and mortality statistics.[5]

The most frequent disorders in inpatient population were CVD, CNS infections and nerve lesions and those among outpatients were epilepsy and seizure disorders, CVD and headaches. Apart from CNS infections, this pattern was basically the same with the neighboring country, Thailand, from where CVD was the most common disease followed by headache and epilepsy and polyneuropathy among both inpatients and outpatients.[9] According to the pattern of neurological diseases at a tertiary hospital in Bangladesh, the commonest was stroke (47.5%), followed by seizures (9.3%), diseases of spinal cord (7.8%).[10] When we compared to the data of other countries outside Southeast Asia such as neurology outpatient clinics of the King Fahd Hospital of Saudi Arabia's tertiary care Dammam University hospital, our data was found exactly the same because epilepsy, stroke and headaches were the commonest among their outpatient clinics.[11] Similarly, in adult neurology clinic in Obafemi Awolowo University Teaching Hospitals Complex, Osun state, Nigeria, epilepsy and stroke were the commonest neurological disorders in the outpatient setting.[12] To compare with those reported from United Kingdom (UK), consultations for headache and epilepsy accounted for over a quarter of all encounters in neurological practice.[13] So the pattern was more or less the same across the world except CNS infections which were found more commonly at YGH, Myanmar than neighboring countries and other developing and developed countries outside Asia.

When ranked in order among referred cases from other specialties including general medical wards and other hospitals, CVD was still the commonest. Second was CNS infections and third was seizure disorders. There were actually two main reasons for referral: for neurologist's opinion and management in some difficult cases or for bed crisis in general medical wards. However, neurologists could not take over all referred cases because of limited bed availability and human resources, and subsequently most of the referred cases could manage at their respective wards by joint care with neurologists. Most of the referred cases came from general medical and surgical wards and others from neuro-allied specialties such as physical and rehabilitation medicine ward and neurosurgical ward. Nephrology and hepatology wards referred some patients with encephalopathy to rule out primary neurological etiology. Rheumatological diseases presented with neurological manifestations were also referred for neurologist's advice. Almost all chest surgical referral cases were myasthenia Gravis patients who was needed for preoperative assessment or perioperative management for thymectomy. Oncology ward sought help for patients with brain metastasis, confusion due to electrolyte imbalances, chemotherapy-induced neurotoxicity including peripheral neuropathies and PRES. Most patients referred from cardiac medical and cardiovascular surgical wards were CVD.

Sources of inpatients admitted to the Neurology ward were direct admission from neurology outpatient clinics, through stroke fast track for hyperacute stroke and transfer from other various wards. The total number of inpatients in neurology ward and referral cases to neurologists in this study actually would not still represent the total number of all patients with neurological disorders in the whole hospital as physicians were also managing some neurology cases including stroke, neurological disorders with medical complications and even some pure neurological disorders by themselves. Reasons for referral to neurologists were to take expert opinion and sometimes, because of bed constraints in general medical wards. Although being kept in medical wards, almost all cases accounting in inpatient referral cases were with main neurological problems which neurologists co-managed except very few percentage under encephalopathy as these included uremic encephalopathies and hepatic encephalopathies who were referred to rule out primary neurologic causes of confusion.

When neurologists considered taking transfer to neurology ward, patients with acute stroke within 48 hours, those with diagnostic problems who need to be worked up by neurologists and those who must be managed by neurologists were prioritized. This is evidenced in the pattern seen

in Table 2 where percentage of some diseases such as dementia, cerebellar ataxia, muscle disorders and neuroimmunological diseases which require special procedures like therapeutic plasma exchange in neurology ward as in autoimmune encephalitis, CNS demyelinating diseases, GBS and myasthenia gravis are higher in neurology ward inpatients than referrals. For old epilepsy cases with breakthrough seizures, these were mostly managed in non-neurology wards by adjusting medications by neurologists while cases such as new onset seizures/epilepsy were taken over to neurology ward to work up. However, whenever bed was available, even simple neurological cases were taken over to neurology ward. On the other hand, sometimes, even after prioritized, some of the cases, although indicated to be in neurology ward, did not get chance to be warded in neurology.

In conclusion, CVD, seizure disorders and CNS infections comprised each 28.3%, 17.2%, 9.11% of overall workload of neurology ward. CVD and CNS infections were the leading causes of mortality and morbidity in neurology ward of YGH. From this study, we gained the knowledge on spectrum of neurological disorders in tertiary university hospital of Myanmar, which can help to understand the common diseases locally. At the same time, we can see the burden and workload of neurological diseases and also the constraints on human, material and technical resources. We hope that this study will help on development of community based interventions to improve the neurological care services. Since YGH is a biggest tertiary hospital in Myanmar which can be admitted also from other regions of country, this data may represent Myanmar population. However, further national registry is needed for more detailed data about the burden and pattern of disabling neurological diseases.

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DISCLOSURE

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