

Neurological Admissions at Enugu State University Teaching Hospital: A 5-year Retrospective Review.

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ABSTRACT

Surveys of neurologic admissions into various Nigerian health institutions show an increasing burden of disorders such as stroke in our communities. Few studies have documented the pattern and mortality on neurologic admissions in South East Nigeria. The pattern and mortality of neurologic cases admitted into the medical wards of the Enugu State University of Science and Technology Teaching Hospital was determined. Classifications of medical disorders were grouped using ICD 10 coding system. The total number of neurologic disorders recorded in the case files was 1,031(28%). The commonest causes of neurologic admission were stroke-577(56%), coma of undetermined causes 87(15.3%) and central nervous system infections 84(8.1%). Infections were the commonest causes of admission below 40 years- 48(27.6%) while stroke was the most common disorder after 40 years. Neurologic disorders accounted for 38% of medical ward mortality with a mortality rate of 26.5% (273/1031), most of which was due to stroke 57.1%(156/273). Case fatality rates were highest for coma (50.6%), hepatic encephalopathy 15(36.6%) and hypertensive encephalopathy 10(29.4%). The case fatality rate for stroke was 156(27%). Mortality rates closely reflected admission rates in all cases except in infectious diseases. We concluded that stroke is by far the commonest cause of neurologic admission and death in a tertiary hospital in Enugu. Well-articulated public health educational programs will go a long way to reduce morbidity and mortality of neurologic disorders.

Keywords: Neurologic disorder, stroke, meningitis, stroke mortality, Nigeria.

INTRODUCTION

Recent studies in Nigeria have documented a rising trend of neurologic disorders in the country. (Ezeala-Adikaibe et al. 2014; Onwuekwe et al. 2011; Okunola et al. 2010; Akoria et al.2009). In developing countries such Nigeria factors such as increasing age of the populations, change in dietary habits, high rates of obesity and increasing cases of central nervous system infections are all contributory. The high prevalence of Human Immuno-deficiency Virus and Acquired Immunodeficiency Syndrome (HIV/AIDS) have also added to the spectrum of central nervous system infections in Nigeria. Furthermore, because the morbidity and mortality of neurologic disorders also depends on early diagnosis and treatment which

in turn is dependent on the availability of expertise, effective emergency care facilities as well as the availability and affordability of modern diagnostic facilities. In the country these resources are generally lacking hence morbidity and mortality of neurologic disorders are poorer than expected.

In Nigeria, neurological disorders constitute about 14 - 33.1% of medical admissions (Ojini et al. 2003; Ekenze et al. 2010; Owolabi et al. 2010; Eze et al. 2014;). Stroke remains the most common cause of medical ward admission in Nigeria (Talabi, 2003, Ekenze et al. 2010, Eze et al. 2014). The frequency of stroke in hospital populations has varied from 0.9% to 4.0%, whereas among neurological admissions stroke accounted for

0.5-65% (Ojini et al. 2003; Ekenze et al. 2010; Owolabi et al. 2010; Eze et al. 2014). Knowledge about the admission pattern of neurological disorders will facilitate adequate and proper distribution of resources in health institutions. The aim of this study therefore, was to determine the profile and outcome of neurologic disorders admitted and the medical ward of a tertiary hospital in Enugu, South East Nigeria.

MATERIALS AND METHODS

Research Setting

The study was carried out in the medical wards of the Enugu State University of Science and Technology Teaching Hospital (ESUTTH), Enugu, Nigeria. The hospital was upgraded to a teaching hospital in 2005, and is the second largest health care facility in Enugu which is the capital of Enugu state. At inception the hospital had a 36-bed capacity dedicated to medical cases. However, at the time of data collection, the bed capacity for neurologic admissions is 50. Medical patients in the ESUTTH are routinely admitted into any of the female and male medical wards and come from more than 5 states of the federation. In addition, medical patients may be admitted into surgical and gynecological wards when there are insufficient bed spaces in the regular medical wards.

Study protocol.

We undertook a 5-year review of neurologic admissions into the ESUT-TH Enugu, Nigeria between January 1, 2006 and December 30, 2010. Morbidity data was obtained from the respective ward registers and, subsequently, medical record registers. Mortality data were also obtained from the same sources, as well as from the ward copies of death certificates. The sampling approach was to review all (100%) admissions and mortalities within the period under review. These admissions were evaluated retrospectively for patients' demographic details, duration of admission, diagnoses and outcome. In case of

death, the cause(s) of death were obtained for all cases and data included date and cause of death. Only cases admitted into the three medical wards were included. In cases of incomplete data or conflicting diagnoses such patients were excluded. For ease of classification, medical diagnoses were grouped using ICD 10 coding system (WHO 2010). ICD 10 coding was done by trained medical record officers of the medical records department of the hospital. Primary and secondary diagnosis (medical comorbidity) on discharge was recorded. In cases of repeated admissions of the same individual, they were recorded as different cases (admissions). Income, distance from the medical facility, as well as level of education of patients were not included in the hospital register thus were not included in the analysis. Data on occupation was incomplete and was not included in the analysis. Ethical clearance was obtained from the ethics committee of the Enugu State University of Science and Technology Teaching Hospital. Data was manually sorted and coded in a personal computer. For database management and statistical analyses, we used the SPSS version 20 (IBM Corporation, New York, USA).

RESULTS

A total of 4,447 patients were admitted during the period under review. Out of this number 582 were excluded because of incomplete data or unavailable records and the remaining 3,685 (82.9%) were analyzed. The total number of neurologic disorders recorded in the case files was 1,031(28%). Males were 621 (60.2%) and females 410 (38.9%); the male female ratio was 1.5:1. Most patients were city dwellers 674 (65.4%) and the rest 357 (34.6%) came from surrounding towns and villages. The age of the patients ranged from 16 to 105 years with a mean age of 56.9 (17.3) years (men 57.4 (17.4), and women 56.1 (17.2), $P = 0.24$). Most patients were older than 60 years (621(60.2%). The number of days spent on admission ranged from 1 to 47 days with a mean of 10.6 (9.4) and a median of 8 days.

Age and gender distribution of the patients

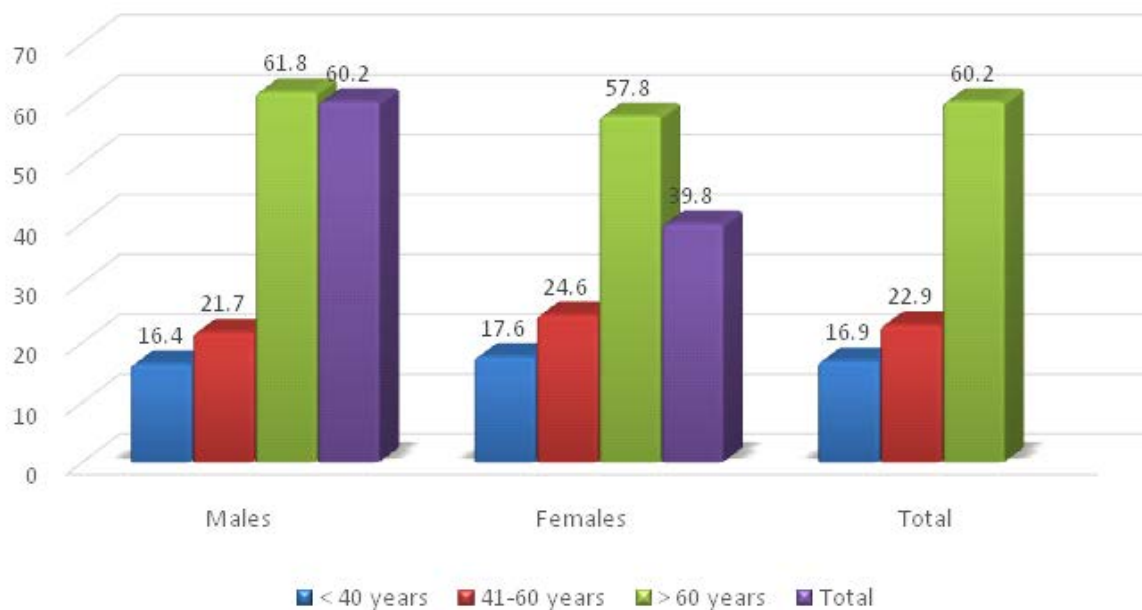


Figure 1.

Neurologic admissions

By far, the commonest causes of neurologic admission were stroke-577(56%), coma 87(15.3%) and central nervous system infections 84(8.1%). Hepatic encephalopathy

and hypertensive encephalopathy accounted for 41(4%) and 34(3.3%) respectively. Vertigo/headache/delirium which could be caused by various disorders were the primary diagnosis in 52 (5%).

Table 1. Neurologic admissions, mortality and mean age of admissions.

Neurologic disorder	<40	40-60	>60 years	Total (admission rate)	Mortality rate	Mean age(SD) of admission
Stroke	43(24.7)	126(53.4)	408(65.7)	577(56)	156(57.1)	61.2(14.2)
Coma	26(14.9)	45(19.1)	87(14)	158(15.3)	44(16.1)	56.4(17.3)
infections	48(27.6)	19(8.1)	17(2.7)	84(8.1)	18(6.6)	38.5(17.3)
Vertigo/headache/delirium	15(8.6)	11(4.7)	26(4.2)	52(5)	14(5.1)	52.2(19.9)
Status epilepticus	18(10.3)	10(4.2)	22(3.5)	50(4.8)	11(4)	48.9(19.8)
Hepatic encephalopathy	20(11.5)	8(3.4)	13(2.1)	41(4)	15(5.5)	43.9(18.9)
Degenerative diseases	-	2(0.8)	28(4.5)	30(2.9)	5(1.8)	70.7(10.9)
Hypertensive encephalopathy	3(1.7)	13(5.5)	18(2.9)	34(3.3)	10(3.7)	55(14.2)
Neuropathy	1(0.1)	2(0.8)	2(0.3)	5(0.5)	-	50(13.6)
Total	174(16.9)	236(22.9)	621(60.2)	1031(100)	273(26.5)	56.9(17.3)

As expected, patients with degenerative disorders were the oldest (mean age of 70.7(10.9 years) while those with infections were the youngest (mean age of 38.5(17.3 years). The distribution of cerebrovascular disorders (excluding hypertensive

encephalopathy) cases showed that first ever stroke accounted for 526 cases (91%) while the remaining had repeat stroke 21(4%) and transient ischemic attacks 30(5%). The distribution of other disorders is shown in figure 2.

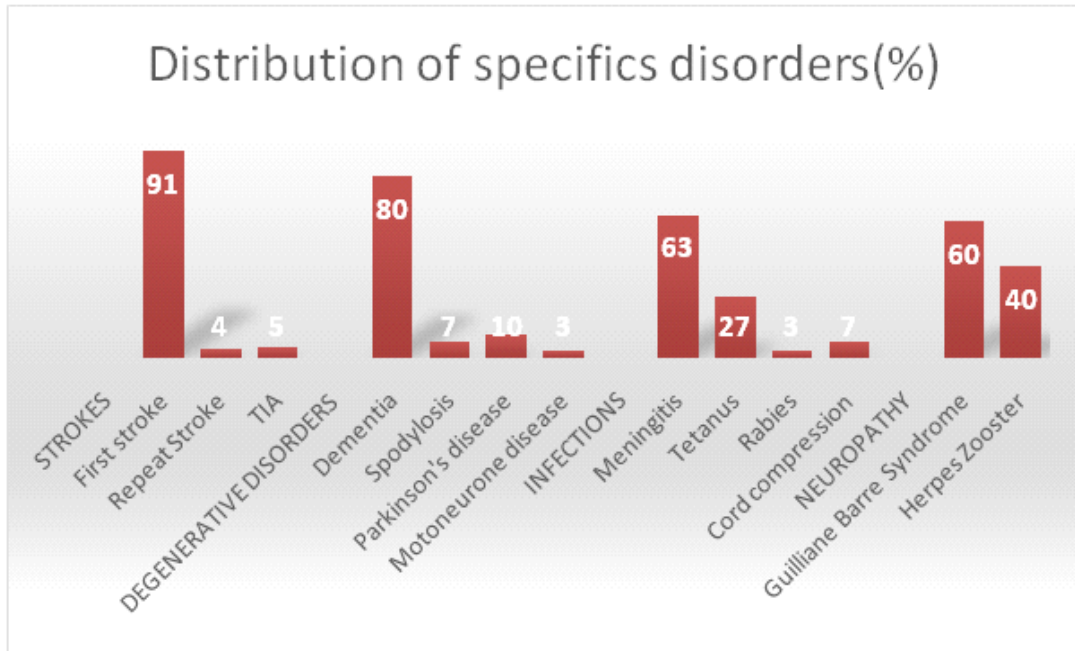


Figure 2.

The overall mortality rate of neurologic disorders was 26.5% (273/1031), most of which was accounted by stroke 57.1% (156/273) and coma 16.1% (44/273). Mortality rates were similar in males and females 168(27.1%) and 105 (25.6%) respectively. P=0.61 and did not

significantly vary with age. P=0.15. Case fatality rates were highest for coma (50.6%), hepatic encephalopathy 15(36.6%) and hypertensive encephalopathy 10(29.4%). The case fatality rate for stroke was 156(27%) (Table 2).

Table 2. Case fatality rates of various neurologic disorders

	Strokes	Coma	*Hep-P	**SE	Infections	#H-P	^β Degen-D	*HVD	Total
Males	99(28.7)	23(25.6)	11(36.7)	7(20)	12(25.5)	6(28.6)	3(15)	7(23.3)	168(27.1)
Females	57(24.6)	21(30.9)	4(36.4)	4(26.7)	6(16.2)	4(30.8)	2(20)	7(31.8)	105(25.6)
<40	13(30.2)	6(23.1)	11(55)	2(11.1)	9(18.8)	2(13.3)	-	2(13.3)	44(25.3)
40-60	25(19.8)	10(22.2)	2(25)	-	5(26.3)	3(27.3)	1(50)	3(27.3)	52(22)
>60	118(28.9)	28(15.8)	2(15.4)	9(40.9)	13(21.4)	9(34.6)	4(14.3)	9(34.6)	177(28.5)
	156(27)	44(27.8)	15(36.6)	11(22)	18(21.4)	10(29.4)	5(16.7)	14(26.9)	273(26.5)

*Hep-P=Hepatic encephalopathy ; **SE=Status epilepticus; #H-P=Hypertensive encephalopathy; ^βDegen-D=Degenerative disorders; *HVD= Headache, vertigo and dizziness

Overall, mortality peaked at 60 years and above and mirrored admission rates in all cases except in infectious diseases. No patient with neuropathy died within the period under review.

DISCUSSION

This study has revealed a high rate of neurologic admissions especially stroke in a tertiary hospital in South East Nigeria. Because of the paucity of manpower and emergency treatment facilities, most of these patients are treated by general practitioners and non-neurologists. This suggests that these patients may not receive optimum care which may in turn lead to poor outcomes and prolonged hospital stay. (Steiger et al. 1996; McColgan et al. 2010; Forbes et al. 2014). Available studies suggest an increasing burden of non-communicable diseases including degenerative and cerebrovascular disorders at least among adults, in many Nigerian communities (Okunola et al. 2010; Ulasi et al. 2011; Ezeala-Adikaibe et al. 2014), hence an increased workload on few available neurologists and other specialists in the country.

The major findings in this study are 1) neurologic admissions accounted for about 28% of all medical admissions, 2) stroke is by far the commonest cause of neurologic admissions, 3) the mortality rate of neurologic disorders admitted in the medical ward was 26.5%, highest in hepatic encephalopathy (36.6%), 4) rare disorders such as rabies accounted for 3% of all CNS infections admitted into the ward.

The duration of hospitalization in the index study ranged from 1 to 47 days with a mean (sd) of 10.5(9.4) days. This is within the range reported by previous authors (Ojini et al. 2003; Ekenze et al. 2010; Owolabi et al. 2010; Eze et al. 2014). Several reasons may account for the duration of neurologic disorders. Whereas, the chronicity and severity of a neurologic case may lead to a long hospital stay, very brief hospital stay may also be due to high mortality rates.

The rates of neurologic admissions in Nigerian vary widely. This may be as a result of increasing awareness, increased incidence, availability of manpower and geographical differences in the country. Our finding (28%) is

higher than the projected global prevalence of neurological disorders of 14.7% by 2020 (Menken et al. 2000) but within the range of previously reported rates of 14.8% to 33.1% (Ojini et al. 2003; Ekenze et al. 2010; Owolabi et al. 2010; Eze et al. 2014;). Our finding not only supports the current trend of increasing burden of neurological disorders especially in developing countries but may also be due to severe and dramatic nature of neurologic disorders necessitating higher rates of admission than other disorders.

The patients' demographic profile reflects that most of the cases were males 61.8% and older than 60 years (60.2%). This distribution is also similar to many other studies in the country (Ekenze et al. 2010; Owolabi et al. 2010; Eze et al. 2014). The preponderance of males may be attributed to stroke commoner in males (Onwubere et al. 1999; Ezeala Adikaibe et al. 2014). Furthermore, the gender gap in socioeconomic status in communities of South east Nigeria (Eze et al. 2014) as well as health seeking behavior may all be contributory (Sims et al. 2011). The peak age of admission (>60 years) was in keeping with the peak age of stroke and other degenerative diseases. Many other studies also recorded age distribution of neurologic disorders in admission similar to the index study (Owolabi et al. 2010; Ekenze et al. 2010; Eze et al. 2014).

About 39.2% were 60 years and less which represents the most productive age group. Considering that neurologic disorders are some of the commonest causes of disability and disability adjusted life years (DALYS) in the world, this finding suggests a heavy impact in the community and economy. The youngest group of patients were those with central nervous system infections. One possible reason for this may be the high prevalence of Human immunodeficiency virus which is a common risk factor for meningitis in the young. It is also interesting to note the persisting cases of tetanus and rabies despite ongoing awareness and immunization programs. Cases of rabies and tetanus have been reported in other centers (Ojini et al. 2003; Owolabi et al. 2010).

Stroke accounted for 56% of all neurologic cases and 57.1% of deaths. The mean age of stroke admission in Nigeria range s

from 38.5 to 62.6 years which is supported by the index study (Komolafe et al. 2007; Owolabi et al. 2010; Obiakor et al. 2010; Eze et al. 2014). Higher mortality in males may be due to the older age of admission as age is an important predictor of stroke mortality. The admission rate of stroke increased with age, and peaked after the 7th decade. This finding is in keeping with the pattern and trend of the most significant risk factors for stroke (hypertension and diabetes) in many studies. Male preponderance in this study is similar to the findings elsewhere (Owolabi et al. 2010; Ekenze et al. 2010; Eze et

al. 2014). The mean age of admission of stroke patients and male to female ratio in this study were similar to some studies in the country (Chapp Jumbo et al. 2004; Ogun et al 2005; Owolabi et al 2010; Ekenze et al 2010; Eze et al 2014) and different from others. (Abubakar et al. 1981; Ekenze 2010). Unlike the index study, stroke accounted for more than 56% of neurologic admissions in Kano -77.6% (Owolabi et al. 2010) and higher than in other studies (Ekenze et al. 2010; Eze et al. 2014) (Table 3).

Table 3. Available studies on neurologic admissions in Nigeria.

Author and years	Male: female ratio	Stroke (%)	Infections (%)	Epilepsy/ status epilepticus (%)	Neuropathy (%)	Mortality (%)
Ekenze et al. 2010	1.1:1	67.1	21.8%	-	1.2	
Chapp-Jumbo 2004	1:0.7	61	19.8	3.8	0.5	36.5
Ojini et al 2003*	1.5:1	59.3	30.9	2.6	0.3	
Eze et al 2014	1.3:1	61.1	19.5	5.3	-	
Owolabi et al 2010**	1.5:1	77.6	10.8	1.6	0.6	29.1%
Talabi 2003 ^β	1.5:1	51.4	26.7	6.4	1	
Ezeala-Adikaibe et al.	1.5:1	56	8.1	4.8	0.5	26.5

*5 cases of rabies recorded. **cases of snake bite recorded. ^βcases of ataxic neuropathy recorded.

One of the major reasons for these discrepancies may be due case definitions. For completeness in the index study we included cases of neurologic complications of liver disease and

hypertensive encephalopathy. As expected first-ever stroke was the commonest reason for admission while repeat stroke accounted for 5% of cases.

Table 4. Sample size and age distribution of selected stroke studies in Nigeria.

Author and years	Sample size	<40(%)	40-59 (%)	= 60 (%)	Mean (range)	Age	Mortality (%)
Obiakor et al. 2010	66	10.6	72.7	16.7	-		83.3
Ekeh B et al 2015	120	15.8	40.8	43.3	55(18-85)		35
Abubakar et al 2013	-	-	-	--	55.7(20-84)		
Imariagbe et al 2016	334	-	-	-	62.6(23-100)		44.3
Ogun et al.2005	664	4.8	9	86.1	61.5(27-96)		45.8
Wahab et al 2008	100	-	-	-	58.6(16-96)		28
Chapp-Jumbo et al 2004	859	-	-	-	38.5		
Desalu OO	101	1	15.9	64.4	68(38-95)		
Danesi et al 2013	189	-	-	-	58.5		
Komolafe et al. 2007	135	3	45.9	51.1	62.1(35-90)		15.6
Ezeala-Adikaibe et al.	577	24	53.4	65.7	61.1(27

Of note in this study is the proportion of young people less than forty years admitted stroke (24.7%). This is similar to that reported in Kano (29.3%) and Enugu (27.9%) (Nwosu et al. 2001; Owolabi et al. 2010) and different from others (Obiakor et al. 2011; Desalu et al 2011). Generally, there is a high prevalence of stroke in the young in Africa (Nwosu et al 2001).The high rate of stroke in young Africans reflects high prevalence of hypertension, smoking, drug and alcohol abuse, HIV/AIDS and other risk factors for stroke in the community (Komolafe et al. 2007).

Case fatality rate for stroke in the index study is within the range of 15%- 83.3% reported previously (Komolafe et al. 2007; Owolabi et al. 2010; Obiakor et al. 2010; Eze et al. 2014). In a large multicenter study from south west Nigeria, the case fatality rate for stroke was 9% at 24 hours, 28% at 7 days, 40% at 30 days, and 46% at 6 months (Ogun et al. 2005). Globally, it is estimated that fatality rate of stroke to be around 25 per cent higher for low and middle-income countries. In Gambia, a case fatality rate of 41% has been reported (Gabruskiet et al. 2005). Factors that contribute to stroke survival include efficient and effective emergency response system, early presentation, as well as the availability of thrombolytic agents, efficient intensive care units and an effective stroke unit. Virtually all these factors are non-existent in the hospital at the time of this study.

Coma accounted for 15.3% of neurologic admissions in the present study. Data on the specific causes of coma was limited by the information available in the case notes and could not be confirmed. Common causes of coma in medical wards vary wildly and include stroke, complications of diabetes, chronic liver diseases and central nervous system infections. The reasons for high mortality in females is not known, however, higher mortality rate in patients < 40 years suggests that disorders such as hepatic encephalopathy and infections as possible causes (Roberts et al. 2005; Nwokediuko et al. 2013). HIV/AIDS is one of the commonest causes of medical admissions in the teaching hospital and also a common cause of coma (Okunola et al. 2010; Olarinde et al. 2013; Ezeala-Adikaibe et al. 2014).

Undiagnosed cases of coma suggest lack of appropriate neurologic investigations and/or cases where available investigations did not yield adequate result. Major reason for such cases includes poverty, high cost of imaging modalities, lack of experienced specialists and possible early death. Reported common causes of coma in one study from south east Nigeria were strokes (55.6%) and diabetes (hyperglycemic emergencies and hypoglycemic emergencies (17.7%) and HIV encephalopathy (7.4%). The authors reported an overall mortality of 38.5% (Uwanurochi et al. 2014). Earlier studies documented that hepatic encephalopathy, diabetes, uremia and epilepsy as common causes (Gefland,1973). Like coma, vertigo/headache and delirium in the study may be due to diverse etiologies including toxins

Central nervous system infections (CNS) accounted for 8.1% of neurologic admissions. This finding was similar to some studies and different from others (Ojini et al. 2003; Chapp-Jumbo et al. 2004; Owolabi et al. 2010; Ekenze et al. 2010; Eze et al. 2014). These findings reflect a persisting high burden of infectious diseases in our communities. CNS infections were more prevalent in the 4th decade of life. One major reason for this may be the high prevalence of AIDS in the community. The HIV/AIDS epidemic as well as the resurgence of tuberculosis have not only swept away improvements in life expectancy in some sub-Saharan countries but have added to the burden of neurologic diseases. In one study AIDS dementia complex accounted for 3.5% of neurological admissions (Ekenze et al. 2010). Prior to widespread availability of combination antiretroviral therapy, the prevalence of HIV-associated dementia was estimated to be between 6 and 30% among patients with AIDS. (Valcour et al. 2011). HIV may account for as much as 7.4% of cases of coma. (Uwanuruochi et al. 2014).

Status epilepticus/epilepsy was the cause of 4.8% of admissions. In Nigeria, most causes of epilepsy are preventable, treatable or both by providing basic health care. This high rate of admission may reflect the rates of central nervous system infections, poor medication adherence, high rates of brain injuries and the

high prevalence of stroke in the community. It is not surprising therefore that this high rate observed occurred on the background of high rates of stroke and infections. Our finding is within the range of 1.6 to 6.4 % reported previously (Talabi 2003; Ojini et al. 2003; Eze et al. 2010; Owolabi et al. 2010) (See table 3). The incidence of convulsive status epilepticus per 100 000 have been reported to range between adults between 3.9 to 4.2. Case fatality of status epilepticus in general lies between 1.9% and 40% and depends mainly on age, gender and etiology. Hypoxia, stroke, central nervous system infections and metabolic disorders, are associated with the highest case fatalities of up to 80%. (Rosenow, 2007). Little is known about the causes of status and mortality epilepticus in Nigeria. The case fatality rate of 22% reported in this study is within the global range. Similar to previous studies, few cases of Guillain Barre syndromes were admitted during the period under review (Ojini et al. 2003; Talabi. 2003; Chapp-Jumbo. 2004; Owolabi et al. 2010; Eze et al. 2014).

The overall mortality rate (26.5%) recorded in this study is lower than 36.5% reported in one study (Chapps-Jumbo. 2004) but similar to 29.1% reported in another (Owolabi et al. 2010). The mortality rate of 50% and 36.6% among patients with hepatic encephalopathy is consistent with the range reported in previous studies. (Roberts et al. 2005). The high case fatality rates of preventable morbidities recorded in the study is worrisome and reflects the need for targeted approaches in public health education programs. The importance of medical adherence in the prevention of some disorders like stroke cannot be over-emphasized. Hepatic encephalopathy and hypertensive encephalopathy contributed disproportionately to the deaths attributed to neurologic disorders. These disorders are primarily managed by physicians from other subspecialties and are complications of very severe end organ failures. Unlike some studies (Ojini et al. 2003; Talabi et al. 2003; Ekenze et al. 2010; Owolabi et al. 2010), cases of snake bites, brain tumors, myasthenia gravis and primary ataxia were not admitted within this period in our center. Possible reasons for this may include improved

diagnostic methods such as brain scans for brain tumors. Other studies especially from the south west of the country reported higher rates of Parkinson disease (Talabi et al. 2003). Similar to our report two other studies from south east Nigeria did not report these patterns (Ekenze et al. 2010; Eze et al. 2014). Guillian Barre syndrome and motor neuron disease were not very common neurological diseases necessitating admission from our study. This was similar to that obtained by previous studies. (Ojini et al. 2003; Talabi 2003; Chapp-Jumbo. 2004; Owolabi et al. 2010;Olarinde et al. 2013; Eze et al. 2014).

CONCLUSION

Stroke and coma of undetermined causes were the most common reasons for neurologic admission as well as the most common causes of death in patients with neurologic disorders in a tertiary hospital in Enugu. In view of these findings, concerted efforts should be made to train more neurologists and establish viable neurology services both at the secondary and tertiary health institutions in the region. The improvement of the sanitary conditions in the community and well-articulated public health educational programs cannot be over-emphasized. These interventions will go a long way to reduce morbidity and mortality of stroke and neurologic infections.

LIMITATIONS

The data contained in this study covered a period before the establishment of neurology unit in the department of medicine. Most patients in this study therefore were managed by non-neurologists which may affect both admission and mortality rates. Because of poor documentation and record keeping 582(17.1%) of the cases most of whom may be due to neurologic disorders were excluded. Our sample may not strictly be representative of the pattern of disease at the community level, as most patients in the community do not attend government hospitals due to long waiting time and relatively poorer services when compared to private institutions. These limitations make it difficult to generalize our findings to other populations. Mortality rates of some cases

might have been over estimated because of small number of patients admitted. Another limitation of the study was the teaching hospital setting which was likely to attract patients with severe and dramatic disorders such as many neurologic disorders discussed above. These shortcomings notwithstanding, our findings reflect the burden of neurologic disorders in Enugu and will be useful in formulation of hospital and public health policies by relevant authorities.

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