PROFILE OF NEUROLOGICAL EMERGENCIES IN NIGERIA

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ABSTRACT

Neurological emergencies arise frequently and can have debilitating long term effects if not recognized and treated. A study at the emergency department of the University of Calabar Teaching Hospital showed that of 1104 adult emergencies, 284 (25.7%) were neurological. There was a male: female ratio of 1.3:1 and the ages ranged from 16 to 95 years with a mean age of 49.76 years and a median age of 50. The three leading neurological emergencies were – stroke (52.5%), meningoencephalitis (11.3%), and hypertensive encephalopathy (7%). This review spotlights these three leading emergencies in terms of their epidemiology, risk factors, aetiology, clinical presentations and management. The paper further highlights the challenges in the diagnosis and management of these neurological emergencies in this area of the world and how the prevention and recognition of these conditions may be improved.

INTRODUCTION

Neurological emergencies make up a great percentage of medical emergencies and they have short- and long-term consequences [(1)]. These emergencies often manifest as a range of symptoms including headache, dizziness, seizures, limb weakness, loss of consciousness, etc. The most common emergencies vary from region to region with headache appearing as the majority in some hospitals and cerebrovascular events in others [(2)]. In Nigeria, neurological emergencies account for 17.8% of all medical emergencies [(3)]. These are only some of the neurological problems that neurologists and emergency care physicians attend to. Because many of these conditions depend on appropriate assessment to initiate therapy, outcomes are dependent on how rapidly these can be carried out, including the use of modern imaging techniques [(4)].

Many of these acute emergencies are the manifestations of neurological disorders. This group of disorders ranked as the leading cause of disability-adjusted life years (DALYs) (10.2%) and the second leading cause of deaths globally (16.8%) by the Global Burden of Disease Study in 2015 [(5)]. This grouping included stroke, meningitis, encephalitis, tetanus, Alzheimer's disease, Parkinson's disease, epilepsy, multiple sclerosis, migraine, tension-type headache, brain, and nervous system cancers and other categories of diseases.

A rise in the number of people affected by these disorders despite the numerous advancements in preventive and management measures suggests that there is ineffective implementation to counteract the growing number of patients and risks [(6)]. It is thus necessary that several aspects including the prevention and management of the events leading up to these emergencies be thoroughly studied and invested in globally.

EPIDEMIOLOGY

Several studies have been conducted to determine the prevalence of neurological emergencies in emergency departments in various parts of the world. A study at the emergency department of the University of Calabar Teaching Hospital showed that of 1104 adult emergencies, 284 (25.7%) were neurological [(7)]. There was a male: female ratio of 1.3:1 and the ages ranged from 16 to 95 years with a mean age of 49.76 years and a median age of 50. Stroke was the most common diagnosis, identified in 52.5% of patients with a male: female ratio of 1.3:1.

The second most common diagnosis, meningoencephalitis was found in 11.3% of patents and hypertensive encephalopathy in 7%. HIV encephalopathy was present in 5.2% of cases. Epilepsy and Parkinson's Disease were found to be uncommon. This was similar to another study in Ethiopia by Gebrezgabiher S et. al. where stroke was the commonest neurological emergency (54%) with a male to female ratio of 1.24:1 [(1)]. Another study from the University of Ibadan had earlier found the proportion of neurological emergencies to be 9.5% of all medical emergencies [(8)]. Contrary to some studies that show no difference or a higher number of male than female patients, a study in Brazil determined that there was a higher percentage of female patients (52.5%) and a higher mean age

at 52.5 years [9].

Neurological emergencies can be the manifestation of several disease conditions. Researchers have studied hospital records in various locations to expose the patterns of diseases that result in neurological admissions. Most of the findings observed show that, as expected, the diagnoses reflect the more common infections or conditions in a region. Making some of these diagnoses has been made easier in recent times by the development of more sophisticated imaging techniques such as CT Scanning and Magnetic Resonance Imaging. This has also revealed that certain causes seem to be more prevalent across several regions, especially vascular and infectious causes. A 3-year review of records from the emergency department of the Aminu Kano Teaching Hospital in Kano State showed that ischemic stroke accounted for an emergency in 77.6% of patients. Central Nervous System infections were the second most common with meningitis and tetanus diagnosed in 6.6% and 3% of patients respectively. Hypertensive encephalopathy and status epilepticus accounted for 1.6% each [10].

A more detailed study of 1884 patients carried out in Cameroon showed that of the 502 neurological emergencies among them, 86.1% were non-traumatic. The causes of these included infectious causes (33.1%), vascular causes (16.9%), primary headache (15.3%), metabolic/toxic causes (14.3%) and compressive/mechanical pathologies (13.0%). The two most common of these were malaria and stroke. The third most common, which was primary headaches were divided into tension-type headaches and migraines. The causes of infectious cases are also very diverse. Of the infectious causes recorded in the Cameroonian study, malaria was the most common cause (59.4%), followed by meningoencephalitis (18.2%). Causes of meningoencephalitis were cerebral toxoplasmosis, viral meningitis, cryptococcal meningitis, bacterial meningitis, cerebral malaria, and an association of cerebral toxoplasmosis, cryptococcal meningitis, and HIV encephalitis [11]. The prevalence of infectious causes is linked to the endemicity of those diseases and varies across different regions.

The following sections of this article discuss briefly the three leading neurological emergencies as identified by the Phillip-Ephraim et. al. study at the emergency department of the University of Calabar Teaching Hospital.

STROKE

The frequency of stroke is high. For example, it was responsible for 52.5% of neurological emergencies seen at the University of Calabar Teaching Hospital, stroke is the leading neurological emergency condition [2]. Similar studies such as the one done in Ethiopia also identified stroke as the leading condition with a 54% share of cases [1] while in the study done at the University of Ibadan, stroke made up 74.4% of neurological emergencies seen [8].

At the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Osun state; a retrospective study done by Komolafe et. al. showed that stroke made up 11.8% of a total of 1133 neurological disease diagnoses in the outpatient clinic. Although stroke was the second commonest disorder after epilepsy here, this study further demonstrates the prevalence of stroke[12].

At this same facility, another study by Komolafe et. al. revealed that stroke made up 22% of all neurological admissions. Of these, there was a male to female ratio of 1.3:1 and a mean age of 62+ 12 years[13].

The Phillip-Ephraim et. al. study further revealed the mean age of stroke patients to be 56.5 years in females and 56.9 years in males, demonstrating that increasing age is a non-modifiable risk factor for stroke. Other non-modifiable risk factors for stroke are – race (higher in blacks), genetics (parental or family history of stroke), gender (higher in females for reasons related to longer lifespan compared to males, pregnancy and postpartum related risks, oral contraceptive use, and post-menopausal therapy, etc.) [14]. The modifiable risk factors associated with stroke are - hypertension, dyslipidemia, regular meat consumption, elevated waist-to-hip ratio, diabetes, low green leafy vegetable consumption, stress, added salt at the table, cardiac disease, physical inactivity, and current use of cigarettes with the occurrence of stroke [15]. In the stroke profile study by Komolafe et. al., hypertension (73%,), diabetes mellitus (16%) and heart disease (atrial fibrillation) (2%) accounted for the leading predisposing factors [13].

The clinical features of stroke vary but are typically sudden in onset – sudden weakness (usually on one side) of the face, arm, or leg, a sudden difficulty with speaking or understanding speech, sudden confusion, sudden visual problems, sudden walking difficulties, sudden loss of coordination and/or balance and sudden severe headache [16].

Stroke is primarily a clinical diagnosis, requiring that the physician possess adequate neuroanatomy and vascular anatomy knowledge. There are 3 crucial questions central to establishing the diagnosis of stroke [4],[17]:

1. Is the occurrence a vascular event or a stroke-like mimic? Here, pointers to a vascular process include sudden onset, focal, and loss-of-function neurological symptoms that may be maximal at the onset. A confirmation can be obtained from a computed tomography scan. Making this distinction is necessary as 19% of suspected

stroke patients have a mimic condition [18]. The most common mimics are brain tumors (such as adenomas, gliomas, and meningiomas), migraines, seizures, metabolic/toxic conditions (such as hypoglycemia, hypercalcemia, hyponatremia, uremia, hepatic encephalopathy, etc).

2. What area of the central nervous system is affected and what blood vessels supply this area? The clinical features can be used to deduce this. The Oxfordshire Community Stroke Project Classification is a reliable guide to answering this question [19].

Table 3: Pulmonary Embolism Rule-Out Criteria (PERC) [19]

TACS	Total anterior circulation syndrome	Hemianopia, hemiparesis, and higher cortical dysfuction
PACS	Partial anterior circulation syndrome	Any two of TACS criteria or isolated higher cortical dysfuction
LACS	Lacunar syndrome	Pure motor, pure sensory, sensorimotor strokes, clumsy hand-dysarthria syndrome or ataxic hemiparesis
POCS	Posterior circulation syndrome	Isolated hemianopia or brainstem or cerebellar signs

3. Is the occurrence of a vascular event an ischemic or hemorrhagic origin? This distinction can be made through a non-contrast computed tomography scan.

The specific approach to the management of ischaemic stroke differs from hemorrhagic stroke. However, stroke is a medical emergency and as such must be managed as one. Ideally, all patients with a suspected stroke should be managed in an acute stroke unit. Hypoglycaemia must be ruled out at the early stage of management. Airway patency should be ascertained and the patient must be screened to check for swallowing difficulties. Oxygen should only be administered when oxygen saturation <95%. Hypertension is a common precipitant of stroke. If there are no contraindications, blood pressure must be lowered rapidly using parenteral titrable hypertensives in hemorrhagic stroke when SBP > 150mmHg and reduced cautiously in ischaemic stroke if systolic BP >220mmHg or diastolic BP >120mmHg. After ruling out hemorrhagic stroke through a non-contrast CT scan, ischaemic stroke is managed by the administration of recombinant human tissue plasminogen activator (rt-PA) in a dose of 0.9 mg/kg (to a maximum of 90 mg) in the absence of contraindications. The outcome is better when this is done within 4.5 hours of onset. Furthermore, 300 mg of aspirin must be started within 24 hours of symptom onset and continued for 2 weeks thereafter. Statin therapy should be instituted in the presence of dyslipidemia. The management of hemorrhagic stroke requires that patients on oral anticoagulants and an international normalised ratio >1.4 discontinue their medication for a minimum of 10-14 days while the INR is reduced to normal through the combined use of prothrombin complex concentrate and IV Vitamin K [20][21].

MENINGOENCEPHALITIS

Meningoencephalitis was reported to be the second most common neurological emergency condition by Phillip-Ephraim et. al with an 11.3% share of cases [2]. This finding corroborated an earlier study published in 2004 which reported a 21.4% incidence of meningoencephalitis from 1393 neurologic admissions over ten years (second only to stroke) [22]. A differing view can be found in a study by Ogah et. al which placed seizures as the second most common neurological condition with 15.9% of cases (36 out of 227) [8]. By contrast, the Phillip-Ephraim et. al. study found seizures to be the tenth most occurring condition with 8% (8 out of 284 cases) [2].

As Nigeria lies within the meningitis belt of Sub-Saharan Africa, the figures for meningoencephalitis are hardly a surprise [23].

Table 3: Pulmonary Embolism Rule-Out Criteria (PERC) [19]

Source: https://microbewiki.kenyon.edu/index.php/Meningitis_In_West_Africa

Worthy of note is that these studies were carried out in the Southern part of Nigeria, indicating that the Northern part of the country (which most directly lies within the meningitis belt) could have much higher rates of meningoencephalitis cases.

Risk factors for the development of meningoencephalitis include extremes of age, recent head trauma or neurosurgery, contiguous infections like otitis/sinusitis, indwelling ventriculoperitoneal shunts, immunocompromised conditions like diabetes, chronic steroid use, HIV infection, asplenia, immunosuppressive drug use, chemo- and radiotherapy, etc. The aetiological agents responsible for meningitis could be of bacterial, viral, fungal, parasitic origin. Commonly implicated bacterial causes are Streptococcus pneumonia, Haemophilus influenzae, Neisseria meningitidis, Mycobacterium tuberculosis, etc. Herpes simplex virus is a common viral cause. Fungal agents are Cryptococcus species, Coccidioides sp., etc. Parasitic causes such as Plasmodium and Toxoplasma are also implicated. Coxsackie, Echoviruses, and Herpes simplex are the organisms that most commonly cause encephalitis (which is usually due to a viral agent) [24]. Particular attention should be paid to Herpes simplex virus type 1 infection which can cause mortality very quickly [25].

At presentation, fever, altered sensorium and seizures point strongly to meningoencephalitis. Headache, nuchal rigidity, aphasia, catarrhal symptoms, hemiparesis, nausea, vomiting, acute memory, speech and memory disturbances, hallucinations, and psychosis, are other symptoms that could be present. It is important to recognise that the pattern of presentation of these symptoms may vary. In the case of bacterial meningitis, for example, two clinical patterns of presentation are known – an acute presentation (usually less than 24 hours) which has a bad prognosis and a more insidious presentation which is usually associated with a better prognosis [26]. Depending on the underlying pathogenic process and stage of presentation, the signs and symptoms of meningitis may be hard to spot and the clinician would need to have a high index of suspicion [27]. Especially in the immunocompromised and the elderly age group, signs of meningism may be absent [27], [28], [29]. In the initial stages, fever is absent in as much as 30% of patients [28]. A history of antibiotic use may also alter how it presents and this should be sought for [30].

A lumbar puncture could be performed with a subsequent CSF analysis of the opening pressure, cytology, biochemistry, lactate, Gram's stain, culture, and sensitivity for diagnostic findings. A PCR assay also aids in the quick detection of aetiological agents. Although the CSF analysis offers confirmation of the diagnosis especially in the immunocompromised who have a wide range of differentials, there are arguments against it. A common argument is that the emergence of strong antibiotics that can be used against a wide range of aetiological agents does not require the confirmatory diagnosis from an LP. There are also fears about cerebellar tonsillar or uncal herniation. However, these mostly occur when specific contraindications to LP are already present. These contraindications include signs of raised ICP, respiratory compromise (e.g. tachypnea, hypoxia, abnormal breathing pattern), and cardiovascular compromise (e.g. hypotension). The most commonly used neuroimaging technique is a computed tomography scan. It is usually done to exclude the possibility of raised intracranial pressure before carrying out a lumbar puncture. It is also necessary for immunocompromised patients to identify other possible differentials. However, practical concerns about the danger and the time lost in transporting the patient, the need to commence empirical antibiotic therapy early, and that raised intracranial pressure can be detected clinically, usually do not favor the use of a CT scan. Electroencephalography is also useful when acute encephalitis is suspected to exclude a generalized encephalopathy [24], [30].

The emergency management of this condition requires ensuring that the ABC essentials of resuscitation are followed – this includes ascertaining the need for intubation as well as a detailed assessment of the vitals i.e. heart rate, blood pressure, temperature, oxygen saturation, respiratory rate, and the Glasgow Come Score of the patient. It is necessary to do a random blood glucose check and then proceed to secure intravenous access for fluid resuscitation and blood sample collection. Blood culture, hemogram, coagulation profile, liver and renal function tests, serum lactate levels are crucial investigations to be carried out. Seizures must also be aborted with an appropriate anticonvulsant [30].

Before the specific aetiological cause is identified, empirical antibiotic therapy may be commenced as shown in the table below:

Table 2- Empirical antibiotic therapy by age group[30].

Age Group	Empirical antimicrobial therapy	
Neonates + infants	Ampicillin plus cefotaxime	(200 mg/kg/d) (100-200 mg/kg/d)*
Children 3 months to 18 years	Cefotaxime or ceftriaxone +/- vancomycin	(200 mg/kg/d)+ (80 mg/kg/d)+ # (60 mg/kg/d)+ #
Adults 18-50 years	Cefotaxime or ceftriaxone +/- vancomycin	(2 g six hourly) (2 g twelve hourly) (1 g twelve hourly)# ^
Adults > 50 years	Ampicillin plus cefotaxime or ceftriaxone +/- vancomycin	(2 g four hourly) (2 g six hourly) (2 g twelve hourly) (1 g twelve hourly)^

+The dose should not exceed the adult dose
**< 1 month of age = 50 mg/kg every 12 h; > 1 month of age = 50 mg/kg every 6 h*
#50 mg/kg every 12 h may be given in the first 24-48 h
^Therapeutic levels should be monitored

Where raised ICP is a feature, intravenous mannitol can be used to reduce the extracellular fluid accumulation along with other measures such as nursing the patient in a head-up position to improve venous drainage, careful fluid monitoring, rapid intubation, and mechanical ventilation to allow oxygenation, early sedation, and normalisation of arterial PCO_2.

Antiviral therapy with acyclovir could be a life-saving measure if acute encephalitis is suspected [31]. Corticosteroid therapy with dexamethasone has been proposed to stop the effect of inflammatory cytokines which are released during the lysis of bacteria following the commencement of antibiotic therapy. Steroids may also be used in acute encephalitis. However, the use of steroids in acute encephalitis is heavily debated. For definitive management, the modification of empirical antibiotic therapy is subject to the specific aetiological agent identified following CSF culture and sensitivity [30].

HYPERTENSIVE ENCEPHALOPATHY

This was reported to be the third leading neurological emergency by Phillip-Ephraim et.al. with a 7% share of cases [2]. Backing this finding are the results from the study by Ogah et. al.which reported hypertensive encephalopathy as the third-most occurring neurological emergency (7.9% - 18 of 227 cases) [8].

Usually, the result of uncontrolled primary hypertension, hypertensive encephalopathy is a form of hypertensive emergency that may also occur from secondary causes of hypertension. Its main presenting features are sudden elevated blood pressure (typically > 220/120 mmHg) accompanied by neurological symptoms such as headache, nausea and vomiting, altered mental status, visual disturbances, seizures, coma. The diagnosis of this condition is made following the lowering of blood pressure with antihypertensives and then excluding other causes of the neurologic manifestations. A brain MRI scan is preferred to make this exclusionary diagnosis, particularly in identifying posterior reversible encephalopathy syndrome (PRES) which is the typical imaging pattern characterised by vasogenic cerebral edema. A brain MRI scan tends to show a pattern typically posterior hyperintensity occipital greater than frontal in PRES. Besides other supportive and symptomatic management, the definitive treatment of hypertensive encephalopathy lies in the cautious lowering of blood pressure through the initial use of parenteral antihypertensives (such as labetalol, fenoldopam, clevidipine, nicardipine) to achieve adequate dose titration. The goal reduction is 25% within the first 24 hours [32].

CHALLENGES

The challenges that impede the management of neurological emergencies and disorders span several causes. Beginning with those that occur even before the arrival of patients at the emergency room, delays in seeking help when symptoms arise contributes to difficulties in treatment. Following that, accessibility and cost of necessary diagnostic procedures, especially in poorer regions of the world negatively impact proper diagnosis and management of conditions. For the same reasons, treatment options and other related therapy may be difficult to access for some patients.

Other challenges are those involving myths, misconceptions and stigmatization of some of those conditions as in the case of seizure disorders.

This makes it important to intensify public health education to increase awareness of neurological disorders and reduce stigmatisation of persons with some of the neurological disorders[2].

Public health education is also necessary to encourage better health-seeking behaviour among the populace that can positively impact the management of neurological emergencies.

CONCLUSION

Neurological emergencies account for varying but substantial proportions of medical emergencies in emergency departments all around the world. In Nigeria, symptoms of stroke appear to be the most common cause of presentation to the emergency department. Other important causes of emergency include hypertensive encephalopathy, infectious causes, and seizures. The conditions discussed all have diverse risk factors and causative organisms (as in the case of infectious causes). There are several challenges posed to the proper treatment of patients including delays to seek care, cost, and accessibility of necessary facilities and therapy and social stigma associated with some of the conditions.

Neurological disorders contribute massively to disability and deaths worldwide. In Nigeria, poor accessibility to adequate health care services further worsens the management of neurological disorders. Increased access to health care as well as public health education to prevent stigma and encourage patients to seek care will go a long way in improving the treatment of affected patients.

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