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SEIZURE DISORDERS IN A SOUTH-SOUTHERN STATE OF NIGERIA, PROFILED ON BASES OF SEX AND BODY MASS INDEX

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ABSTRACT
One hundred and fourteen diagnosed cases of seizure patients comprising 70 males (61%) and 44 females at a referral center were examined according to sex and body mass index (BMI) in a retrospective study. Ethical approval was obtained to access data from a referral center for the purpose of this study. 70% of the patients were diagnosed with generalized seizure disorder, 23% had partial seizures (focal seizure disorder), and 7% had combination seizure disorder. In the generalized seizure group, 38% were female, and 62% were male. Among patients who had focal seizure disorder, 46% were left focal and 54% were right focal types. Among the generalized seizure cases, 38% were female and 62% were male. Also, for those with focal seizure, 65% were male and 35% were female. Furthermore, 42% of the females in this category had left focal seizure, and 58% of the males had left focal seizure; whereas 29% of the females and 71% of the males had right focal seizure. Among patients with combination seizure, 37% were male and 63% female. The average BMI was 18.88 for generalized seizure disorder participants and 22.57 for focal seizure. Chi-square analysis and Fisher's Exact Test were used to investigate possible associations between sex and seizure types, and between BMI and seizure types. Results show a non-statistically significant predominance of generalized seizure males. There was no significant association between BMI and any of the seizure types among the patients.

KEYWORDS: Gender, BMI, Seizure disorder, EEG.

INTRODUCTION
Epilepsy is associated with irregular electrical activities in the brain, which often times, result in seizure. Seizure is a medical condition in which neurons or brain cells suddenly function abnormally, sending uncontrolled bursts of electrical signals that may temporarily disturb electrical brain activities, resulting, sometimes, in behavioral, locomotive, and emotional changes and varying levels of unconsciousness.[1,3] However, not all seizures are actually as a result of epilepsy. Based on the guidelines by World Health Organization (WHO) and International League Against Epilepsy (ILAE), epilepsy can be defined as a chronic, central nervous system disorder which has such features as unprovoked recurrent seizures arising from an excess discharge from cerebral neurons of different origins.[2,4]

Seizure Categories
Some type of seizure may be provoked, in which case it occurs due to some other conditions, such as stroke, high fevers, alcohol, drug withdrawal, or head injury). It is reported that about 25% to 30% of all seizures are actually provoked seizures.[3]On the other hand, sometimes, even when there are no particular underlying conditions, the brain of an individual may produce spontaneous seizures, in which case it is termed unprovoked seizure. When the cause of an observed seizure is not known or traceable, researchers and clinicians refer to it as idiopathic seizure.[3,4]

The three major categories of seizure disorders are generalized seizure, focal seizure – also termed partial seizure and combination seizure.[4] Generalized seizure disorder occurs in both right and left sides of the cerebral hemispheres, and usually results in more severe effects. Focal seizure disorder affects either the right or left cerebral hemisphere, and its symptoms, thus, occur on just one side of the body. However, combination seizure disorder implies that an individual may suffer from both categories described above, as a condition in which seizure can start in only one of the hemispheres, but later spread to both hemispheres and become generalized seizure.[4]

Seizure Durations
Seizures may last for very short periods, for example, between 30 seconds to 1 minute. Seizures that last longer are capable of causing damage to brain cells,[1]and if they

affect many nerve cells in parts of the brain, the damage can be permanent. Some seizures may alter blood chemistry, due to the body's attempts to adjust for the purpose of managing the physical impacts of fits or convulsions.[5]

Seizure Data

The global burden of such diseases as seizure disorders is a phenomenon that should attract not only the attention of health care professionals, but also the attention of researchers and policy makers alike. The importance of regular collection, collation, analysis, presentation and updating of data to research workers and policy makers cannot be overemphasized.

Epilepsy was reported in 2019 to affect over 70 million individuals globally, with most living in developing countries.[6] In 2016, an estimate of more than 125,000 deaths occurred from epilepsy, according to a global, regional and national study of epilepsy.[7]Nevertheless, especially in developing countries and more rural communities, there is inadequate data on epilepsy. For instance, data on epilepsy are either absent or outdated even in a populous country such as Brazil.[8] In Africa, one of the commonest non-communicable diseases of neurologic origin is epilepsy, affecting over 10 million people, including children and the elderly,[9]and Nigeria is not spared.[10] However, Nigeria's data on seizure disorders is lean, especially, for rural and urban populations.[11,5]Therefore, to continuously update and improve the database, which should ideally be useful for health research statistics and health policy management agencies, it is imperative for studies to generate more community-specific data.

Seizure Diagnosis

Electroencephalography (EEG) is one of the widely accepted diagnostic procedures for confirming whether a person has had a seizure, or is likely to have one in the future. EEG is a method of recording changes in electrical patterns of the brain, and so, depicts seizures and, sometimes, other conditions. It is a safe and painless procedure which presents the recording (result) in the form of an electroencephalogram.[12] Sometimes, a healthcare provider might diagnose a seizure from clinical manifestations, physical examination, or even medical history,[13] but will ideally send suspected epilepsy/seizure disorder cases for further tests, such as EEG, confirmation.[14]

Neurologists – medical specialists that treat diseases or disorders associated with the brain and nervous system – can study the EEG report and make appropriate diagnosis, based on which to prescribe medications.[15] Cases in which EEG can be of diagnostic aid include but are not limited to brain tumors, severe head injuries, sleep disorders, cerebral infections, encephalitis, excessive drug/alcohol use, migraine, seizures and epilepsy, and even brain death.[16,15] As a matter of common clinical practice, an EEG result is used to either confirm a case of epilepsy, or to rule it out altogether. In 92% of patients who are probably epileptic, the brainwave will show epileptiform rhythm or pattern on the EEG, which suggests origination of the process leading to epilepsy.[17,16] Furthermore, several categories and sub-classifications of seizure disorders can also be identified through clinical manifestations, or by the features of EEG.[14]

Justification

There is need for more state/locality/community-specific data on seizure disorders and epilepsy, to provide reference for health research, planning, and policy making and implementation. Currently, however, the data on seizure disorders in Nigeria is lean, particularly for specific rural and urban populations.(5,11) More so, in the south-southern zone and Bayelsa State, in particular, such data are rare. This study is, therefore, important, to provide community-specific data for the improvement of the state's epilepsy/seizure database. Besides, studies are needed to continuously provide data both to contribute to scientific knowledge and to update health statistics for planning and implementation of health policies.

METHODOLOGY

The retrospective study involved analysis of data from a radio-diagnostic referral center in Bayelsa a south-southern state of Nigeria, and was conducted with ethical approval from the Ethics Committee on Research, College of Health Sciences, Niger Delta University. The data comprised relevant excerpts of medical information on patients who had been referred from various health facilities to undergo electroencephalography at the center, to confirm or rule out epilepsy or seizure disorders, among other neurological conditions.

One hundred and fourteen patients who had been diagnosed of epilepsy or seizure disorders participated in the study. The study sample size was limited to the accessed center. The sample size may be a reflection of the reluctance of people who may have epilepsy to seek medical attention, due, perhaps to fear of stigma, financial limitations, or lack of awareness about the disorder or its medical management.

The researchers observed the inclusion criteria of the International League Against Epilepsy (ILAE), for the purpose of considering the EEG diagnosis report from the consultant neurologists and the medical histories in the data; the criteria requires verifying that a minimum of two unprovoked seizures occurred in two hour intervals.[2] Other conditions, such as provoked seizure, childhood/febrile seizure, and non-epileptic seizure were excluded.

Also, two members of the research team evaluated the data, and scrutinized and harmonized relevant neurological physical and clinical information as well as the electroencephalogram and then confirmed the diagnosis of epilepsy and the classification of seizures,

with reference to the WHO International Classification of Diseases, 10th revision (ICD 10). BMI was calculated from available data, but this was not available for the combination seizure disorder category.

The data were analyzed for the association between sex and seizure disorders, using chi-square test of independence and the relationship between body mass index and seizure disorders was analyzed using Fisher's Exact Test. The SPSS version 20.0 was applied.

RESULTS

The chi-square test of independence to assess the association between seizure disorders and the sex (gender) of participants showed no significant relationship; $X^2(3, N=114) = 2.83$, $p = .005$.

Similarly, there was no statistically significant relationship between seizure disorders and BMI, when Fisher's Exact test analysis was performed; $p = .880$.

Table 1: Chi-square Test $(O - E)^2 / E$.

	Generalized Seizure	Left Focal Seizure	Right Focal Seizure	Combination Seizure	Total
Male	0.02	0.02	0.23	0.74	70
Female	0.26	0.03	0.36	1.18	44
Total	80	12	14	8	114

Table 2: Observed value (Fisher's Exact Probability Test).

BMI	Normal	Low	High	Obese	Total
Generalized Seizure	18	15	17	8	58
Partial Seizure	12	15	15	6	48
TOTAL	30	30	32	14	106

Table 3: Fisher's Exact Probability Test.

$P_A = 0.90$
$P_B = 0.90$
No. of tables evaluated = 10610
P = .880

DISCUSSION

This study was a retrospective investigation of a sample of patients who were visiting a diagnostic referral center to diagnose or rule out seizure. To arrive at the conclusions, the researchers followed a clinical scientific process, by examining participants' medical history, physical neurological data, and EEG patterns, in line with WHO and ILAE guidelines.

Diagnosis of seizure was profiled according to sex and BMI, and statistical analysis was conducted to determine the level of significance in the observed data. Seventy percent of the patients were diagnosed with generalized seizure disorder, twenty-three percent had partial seizure (focal seizure) disorder, and seven percent had combination seizure disorder. The high percentage of generalized seizure was similar to the finding in Melcon *et al*,[18] as well as other findings from Arab and other developing nations.[19]It was, however, different from findings in studies in some developed nations,[20]and a previous report by Ogunniyi.[21]

The difference between female (38%) and male (62%) participants who had generalized seizure disorder was not significant (p = n.s). This finding implies that generalized seizure disorder in this population may not be sex-related as reported, for example, by Mullins *et al* who found more females than males who had generalized seizure,[22]and Nirmeen *et al* who, though, found, similar to the present study, that more males than females had generalized seizure, but in their own study, the sex difference was significant.[19] Also, a review by Olubunmi also showed a dominance of males who have epilepsy in many Africa countries, including Nigeria,[23] although, not specifically, generalized seizure.

In terms of BMI range: Normal (18.5-24.9), underweight (<18.5), overweight (25-29.9), obese (30 and above), there was no relationship between seizure disorders (whether generalized or partial) and normal, underweight, overweight, or obese BMI (p = n.s). Given that this study investigated cases of first time diagnosis, this finding corroborates that of Janousek *et al* who similarly did not find a significant relationship between seizure type and obesity among newly evaluated patients, although obesity appeared rampant in the studied epilepsy patients.[24]Based on scarcity of data on seizure in this part of Nigeria, the finding in the present study are novel.

One investigation suggested that obesity is common among epilepsy patients, and asserted that epilepsy was "higher in blacks than in whites",[24] but acknowledged exclusion of Asian and Hispanic populations as they were quite few to contrast or compare.[24] Some reports have shown that the few available research data on epilepsy in some parts of Nigeria and other developing countries are drawn from investigations carried out on the bases of follow up historical interviews of persons, family members and formulation of questionnaires.[5,23] Future studies need to investigate seizure disorders with live clinically diagnosed cases in this part of Nigeria.

In the present research, some of the challenges encountered include:

* The study not being funded through any grant.

* The study was limited to only one, albeit very centrally located, referral center, due to paucity of funds.

REFERENCES

1. National Institute of Neurological Disorders and Stroke (2023). "Epilepsy and Seizures". Retrieved March 8th *from* http://www.ninds.nih.gov>epileps...
2. Fisher, R.R., Acevedo C., Arzimanoglou A., Bogacz A.,Cross J.H., Elger C.E., t al. A practical clinical definition of epilepsy. *Epilepsia*, 2014; 55: 475–482.
3. Huff, J.J. andMurr, N. (2022). "Seizure".StatPearls Publishing, Treasure Island. Retrieved online from*http://creativecommons.org/licenses/by-nc-nd/4.0/*
4. Cleverland Clinic (2023). "Seizure: What it is, causes, symptoms and types". Retrieved from http:/my.cleverlandclinic.org/health/diseases/22789-seizure
5. Owolabi, L.F., Owolabi, S.D., Taura, A.A., Alhaji, I.D. and Ognniyi, A. Prevalence and burden of epilepsy in Nigeria: A systematic review and meta-analysis of community-based door-to-door surveys. *Epilepsy and Behavio*ur, 2019; 92: 226–23.
6. Lian, Gu., Baoyun L., Qing C., Jianxiong, L., Juanjuan, X., Guangliang, W., Yan, Y., Prevalence of epilepsy in the people's Republic of China: A systematic review. *Epilepsy Research*, 2013; 105(1-2): 195-205.
7. Collaborators GBDE(2019). Global, Regional and national burden of epilepsy: A systematic analysis for the Global Burden of Disease Study. *Lancet Neurology*, 1990-2016; 18: 357–375.
8. Buainain, R.P., Tadeu, C., Oliveira, P., Mason, F.A.L. and Ortega, M.M. Epidemiologic profile of patients with epilepsy in a region of Southeast Brazil: Data from a referral center. *Frontiers in Neurology*, 2022; 13: 822537. Doi:10.3389/fneur.2022.822537
9. Alwan, A., Maclean, D.R., Riley, L.M., d'Espaignet, E.T., Mathers, E.C., Stevens, G.A. and Bettcher, D. Monitoring and Surveillance of chronic non-communicable diseases: Progress and capacity in high-burden countries. *The Lancet*, 2010; 376(9755): 1861–1868.
10. Beaglehole, R., Bonita R., Horton, Richard., Adams, C., Alleyne, G., Asariah, C. *et al*. Health policy:Priority action for the non-communicable disease crisis. *The Lancet*., 2011; 377(9775): 138–1447.
11. Ezeala-Adikaibe, B.A., Orjioke, C., Ekenze, O., Uchenna, I., Onodugo, O., Molokwu, O., Chime, P., et al. Prevalence of active convulsive epilepsy in an urban slum in Enugu, Southeast Nigeria. *Seizure*, 2016; 35: 100–105.
12. Epilepsy Foundation. "Diagnosis" *https:www.epilepsy.com/diagnosis*, 2023.
13. Martindale, J.L., Goldstein, J.N., and Pallin, D.J. Emergency department seizureepidemiology.
14. *Emerg. Med. Clin. North AM.*, 2022; 29(1): 15–27.
15. Holmes G.L. Partial seizures in children. *Pediatrics*, 1986; 77: 725–731.
16. Lee, S.W., Blocka, K. and Yetman, D. (2021). "EEG (Electroencephalogram) Overview". Healthline. Retrieved Nov. 9, from *http:healthline.com>health*
17. Lotha, G., Rodriguez, E., Rogers, K. and Singh, S. (2023). Electroencephalography. *Encyclopedia Britannica*.Retrieved Feb. 3,from *http://www.britannica.com>science*
18. Binnie, C.D). "Electroencephalography and epilepsy". In Hopkins, A. (eds). *Epilepsy*. Chapman and Hall, London, 1987; 169–199.
19. Melcon, M.O., Kochen, S. and Vagara, R.H. Prevalence and clinical features of epilepsy in Argentina. A community-based study. *Neuroepidemiology*, 2007; 28: 8–15.
20. Kishk, N., Mourad, H., Ibrahim, S., Shamlou, R., Al-Azazi, Aiman and Shalaby, N. Sex differences among epileptic patients: A comparison of epilepsy and its impacts on demographic features, clinical characteristics and management patterns in a tertiary care hospital in Egypt. *The Egyptian Journal of Neurology, Psychiatry and Neurosurgery*, 2019; 55(39): 1-7.
21. Guekht, A., Hauser, W.A., Milchakova, L., Churillin, Y., Shpak, A. and Gusev E. The epidemiology of epilepsy in the Russian Federation. *Epilepsy Research*, 2010; 92(2–3): 209–218.
22. Ogunniyi, A., Oluwole O.S., Osuntokun, B.O. Two-Year remission in Nigerian epileptics. *East African Medical Journal*, 1998; 75(7): 392–395.
23. Mullins, G.M., O'Sullivan, S.S., Neligan A., McCarthy A., McNamara B.,Galvin, R.J. *et al*. A study of idiopathic generalized epilepsy in an Irish population. *Seizure*, 2007; 16: 204–210.
24. Olubunmi, A.O. Epilepsy in Nigeria– A review of etiology, epidemiology and management. *Benin Journal of Postgraduate Medicine*, 2006; 8(1): 33-35.
25. Janousek, J., Barber, A., Goldman, L. and Klein, P. Obesity in adults with epilepsy. *Epilepsy & Behaviour*, 2013; 28(3): 391–394.