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Interictal Electroencephaolographic Pattern in A Tertiary Center in Nigeria

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ABSTRACT

The objective of this descriptive study was to determine the interictal electro encephalographic pattern in an adult Neurology clinic in a tertiary care hospital in Enugu, South East Nigeria from February 2012 to February 2021. Standard electroencephalogram (EEG) recording using the international 10/20 system was obtained with scalp electrodes from 519 patients. The mean age of patients who presented to the EEG unit was 36.86 years, with a modal age of 20 years. The majority of patients (50.87%) were above 40 years of age, whereas 49.13% were below 40 years. More males were tested than females. Among 359 documented EEGs, 67.1% were abnormal, with nearly equal proportions of focal (50.2%) and generalized (49.8%) epileptiform discharges.

EEG sensitivity in detecting electroencephalographic alteration in clinically suspected epileptic patients in this study was 67.13%. Abnormal readings were more in patients less than 40 years old. Abnormal results were seen more in males 53.53%. This highlights the utility of routine EEG in diagnosis and suggests need for improved access in resource-limited settings.

INTRODUCTION

Electroencephalography (EEG) is a non-invasive and effective technique widely used to monitor brain activity and aid in the diagnosis of epilepsy. EEG recordings are interpreted by neurologists to identify and classify characteristic patterns associated with the disorder, including interictal spikes, sharp waves, and slowing waveforms.[1] Clinically, EEG remains an essential tool for the diagnosis, monitoring, and localization of epileptogenic zones.[1]. Long-term EEG monitoring can provide 90% positive diagnostic information[2] and thus become a golden standard in epilepsy diagnosis.

Epilepsy is defined as a brain disorder characterized by an enduring predisposition to generate epileptic seizures and by the neurobiologic, cognitive, psychological, and social consequences of this condition. [3] Epilepsy is a chronic, non-communicable disorder of the brain characterized by recurrent seizures and occurring in individuals of all ages. The clinical diagnosis of epilepsy can be supported by abnormalities detected on the interictal electroencephalogram (EEG); however, such abnormalities may also occur in otherwise healthy individuals, and their absence does not exclude the diagnosis. Globally, approximately 50 million people are affected by epilepsy, making it one of the most prevalent neurological disorders worldwide. Nearly 80% of individuals with epilepsy reside in low- and middle-income countries, and it is estimated that up to 70% of affected persons could achieve seizure freedom with accurate diagnosis and appropriate treatment.[4]

Epilepsy is a neurological disorder affecting about fifty million people in the world [5] while 85% of them live in the developing countries [6].

SIGNS AND SYMPTOMS OF EPILEPSY

Epilepsy is a chronic disorder characterized by recurrent seizures, which may vary from muscle jerks to severe convulsions [7]. The presentation of epileptic seizures is largely determined by the anatomical origin of the epileptic discharges within the cerebral cortex, as well as the extent and trajectory of their propagation throughout the brain.[4]A hallmark characteristic of epileptic seizures is their stereotyped nature—each episode tends to follow a consistent pattern in an individual. Seizures may produce transient symptoms such as impaired awareness or complete loss of consciousness, along with disruptions in motor function, sensory perception (including visual, auditory, and gustatory modalities), mood regulation, and other cognitive processes.[4]

People with epilepsy tend to have more physical problems (such as fractures and bruising from injuries related to seizures), as well as higher rates of psychological conditions, including anxiety and depression.[4] Similarly, the risk of premature death in people with epilepsy is up to three times higher than in the general population, with the highest rates of premature mortality found in low- and middle-income countries and in rural areas.[8] A great proportion of the causes of death related to epilepsy, especially in low- and middle-income countries are potentially preventable, such as falls, drowning, burns and prolonged seizures[8]

CLASSIFICATION OF SEIZURES

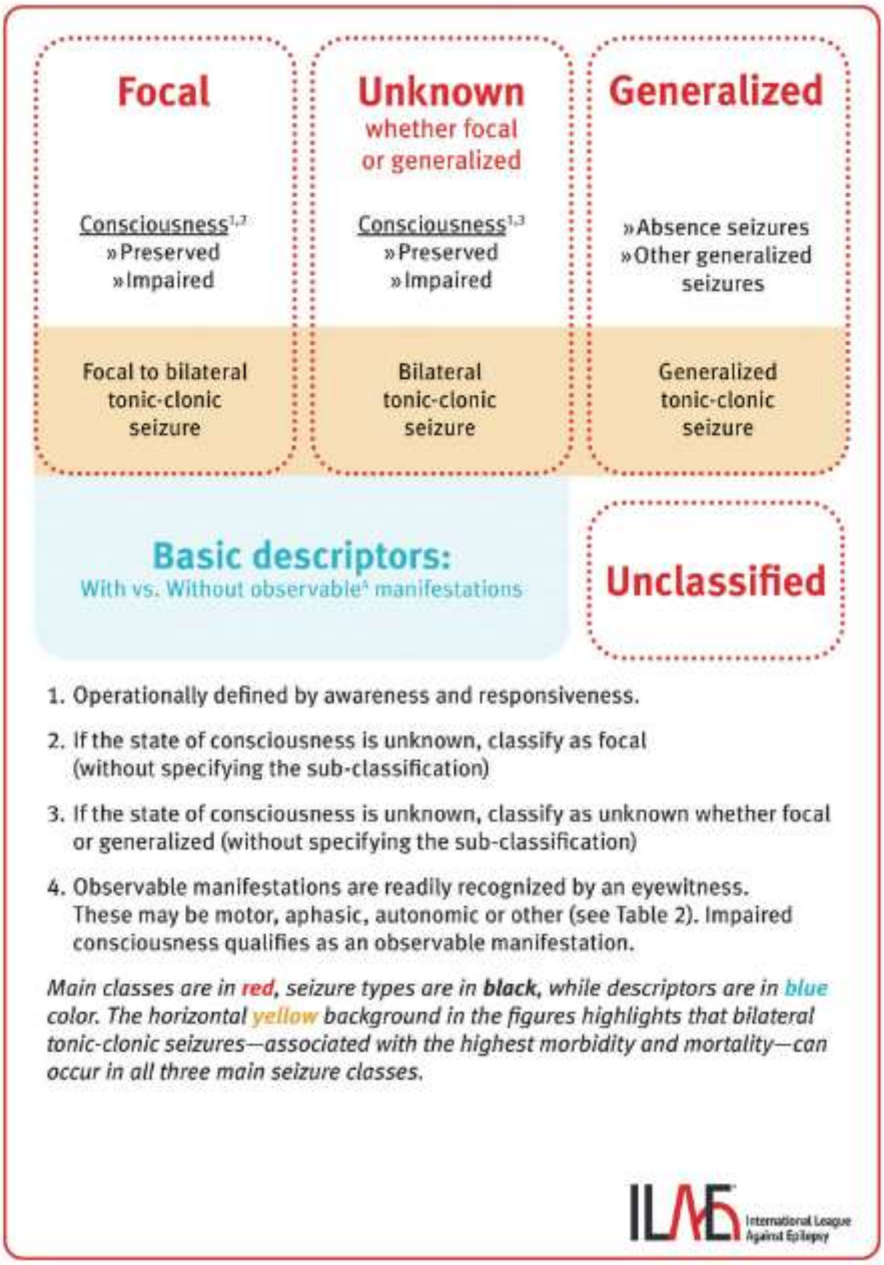

Figure 1. ILAE 2025 Updated Seizures and Epilepsy Classification.[9]

The 2025 update to the International League Against Epilepsy (ILAE) seizure classification introduces key refinements aimed at improving clinical clarity and global applicability. Notably, the term "onset" has been removed from seizure names, and "consciousness" now replaces "awareness" to better reflect both responsiveness and awareness during seizures. The classification also sharpens distinctions between motor and nonmotor features, incorporates newly recognized seizure types, and harmonizes terminology across epilepsy syndromes. These changes enhance diagnostic precision and support more effective communication among clinicians, researchers, and educators.

MATERIAL AND METHODS

This is a descriptive study carried out in Electrophysiology Laboratory in the Department of Medicine University of Nigeria Teaching Hospital from February 2012 to February 2021 on 519 clinically suspected seizure patients. The University of Nigeria

Teaching Hospital Enugu is the largest tertiary facility in South East Nigeria, serving all five states and beyond in the South East Nigeria.

Patients were instructed to withhold their antiseizure medications on the morning of the EEG examination. EEG recordings were conducted using digital CONTEC equipment, with each session lasting a minimum of 20–30 minutes. Electrodes were placed on the scalp following the internationally recognized 10–20 system. Recordings were obtained during both wakefulness and sleep states. Provocative stimuli, including hyperventilation and photic stimulation, were administered for three minutes each.

To ensure consistency, background EEG activity was categorized as either normal (organized and symmetrical) or abnormal (disorganized and/or asymmetrical). Interpretation of the EEGs was performed by consultant neurologists with specialized training and extensive experience in electrophysiological studies. Each recording was assessed for epileptiform features, including interictal spikes, sharp waves, and normal patterns. Abnormal findings were further classified as either generalized or focal.

Demographic data such as age and gender distribution of the patient cohort were documented. Exclusion criteria included incomplete data and recordings of insufficient quality.

RESULTS

In this study, the patient's age ranged from 18 to 87 years. The mean age at presentation to the EEG room was 36.86 years with a modal age group of 18-27years. Most of the patients were more than 40 years old (50.87%) and about 49.13% were less than 40 years old. More males were seen 56.07% than females 43.93%. A total of 519 clinically suspected seizure patients presented at the EEG room but only 359 results were documented. Out of 359 documented results, 118(32.87%) were normal EEG recordings, 241(67.13%) were abnormal recordings. The abnormal recordings had 121(50.21%) focal epileptiform recordings and 120(49.79%) generalized epileptiform recordings. EEG sensitivity in detecting electroencephalographic alteration in clinically suspected epileptic patients was 67.13%. The abnormal readings were seen in 167(69.29%) patients less than 40 years old and 74(30.71%) in patients more than 40years old. Abnormal results were seen in males (53.53%) and females 46.47%. The results are tabulated below in Table 1.

Table 1: Results from the study

Variable	**Findings**
Total patients	519
Documented EEG results	359
Mean age	36.9 years
Age range	18–87 years
Modal age group	18–27 years
≥40 years	50.9%
<40 years	49.1%
Males	56.1%
Females	43.9%
Normal EEGs	118 (32.9%)
Abnormal EEGs	241 (67.1%)
Focal epileptiform	121 (50.2%)
Generalized epileptiform	120 (49.8%)

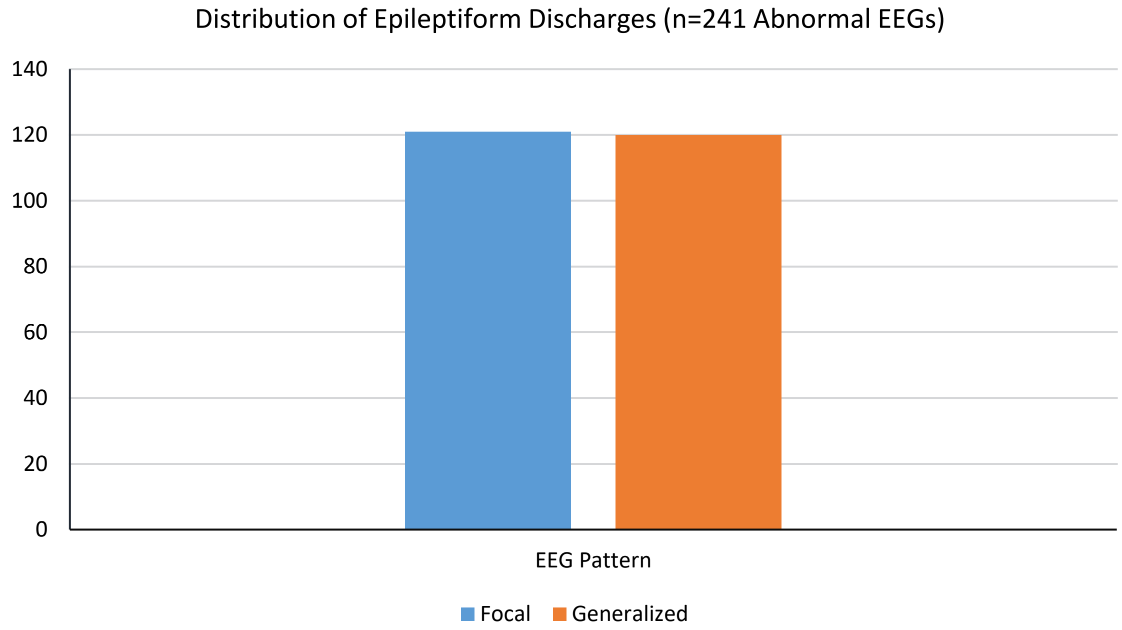

Figure 2: Distribution of Epileptiform Discharges (n=241 Abnormal EEGs)

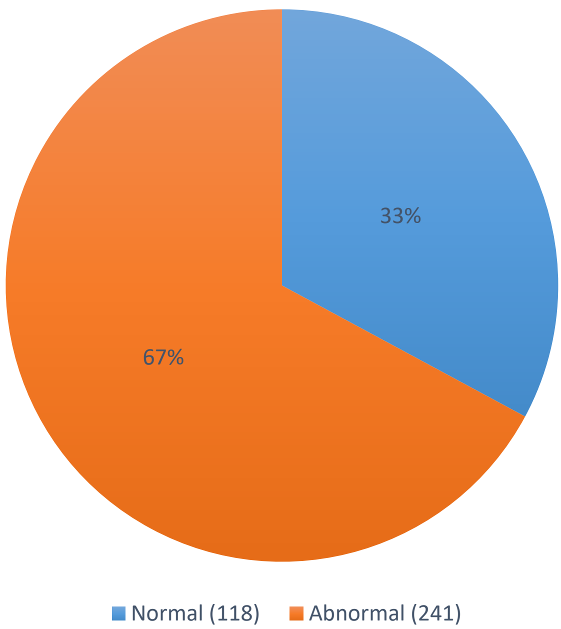

Figure 3: Proportion of Normal versus Abnormal EEG (n=359).

DISCUSSION

The electroencephalogram (EEG), first recorded by German psychiatrist Hans Berger in 1929, marked a significant advancement in brain research. Its relevance to epilepsy became evident soon after, when Gibbs and his team in Boston identified a distinctive 3 Hz spike-and-wave pattern associated with what was then known as petit mal seizures. Despite the emergence of numerous advanced diagnostic tools over the past three decades, EEG remains a cornerstone in the evaluation and treatment of seizure disorders. Its ability to capture the physiological signs of abnormal cortical activity—combined with its affordability and ease of use—makes it an invaluable resource in clinical neurology.[10] Findings in this study revealed only 519 patients had access to EEG testing in the 9 years under review in a tertiary hospital in a resource poor area with high incidence of epilepsy as reports have shown[11]. This reflects several variables including the lack of health care awareness in the society, poor access to health services, unaffordable cost of health services, paucity of trained EEG technicians and Neurologists, unavailability of functional EEG machine and poor government policies on health care services. The percentage of abnormal EEG recording was higher as observed in figure 3 above. Epilepsy is a chronic disease of the brain characterized by an enduring (i.e., persisting) predisposition to generate seizures, unprovoked by any immediate central nervous system insult, and by the neurobiologic, cognitive, psychological, and social consequences of seizure recurrences.[12] Epilepsy occurs across all age groups and affects individuals of every gender, with a global presence. More males underwent the EEG procedure than females, which is reflective of the documented prevalence pattern. Epilepsy occurs somewhat more frequently in males than in females, with its highest rates observed among older adults. This trend is largely attributed to the increased occurrence of strokes, neurodegenerative conditions, and brain tumors within the aging population.[12] Observations in this study revealed a modal age of 20 years of the occurrence of clinical seizures which is similar with a peak prevalence of active epilepsy noted in ages 20-29 years, in a systematic analysis done in sub-Saharan Africa .[13]The frequency of abnormal recordings was slightly higher in males than females but the older age group had lower occurrence of abnormal recording. Results also show slightly higher number of older patients more than 40 years old presenting to the EEG room reflecting the higher frequency of stroke, neurodegenerative diseases and tumors in this age group.

In both pediatric and adult populations, focal seizures are observed more frequently than generalized ones.[12] The underlying causes of epilepsy differ depending on the socio-demographic profile of the individuals affected and the thoroughness of the diagnostic evaluation. However, in approximately half of the cases reported in high-income nations, a definitive cause remains unidentified.[12] In this review as shown in figure 2, focal seizures showed slightly higher occurrence than generalized seizures as revealed by evidences available. For most individuals living with epilepsy, the outlook is generally positive, especially when seizures are effectively controlled. While the condition itself poses a relatively low risk of death, mortality rates can differ significantly depending on factors such as age, seizure type, and whether the epilepsy is idiopathic or linked to an identifiable cause.[12] The highest risk of sudden unexplained death (SUDEP) is seen in those who experience generalized tonic-clonic seizures, seizures during sleep, or have epilepsy that does not respond to medication.[12] The benefit of EEG services cannot be overemphasized, prompt and early diagnosis of seizures with appropriate drug therapy and referral for surgery improves the overall prognosis of seizure disorders.

LIMITATIONS

This is a single center study, and only those referred for EEG were included. Non-inclusion of pediatric EEG data was caused by the insignificant number of pediatric EEG records due to non-referrals during the period under review; hence the emphasis of the study on Adult Neurology EEG recordings. The interruptions encountered in compiling data were due to faulty EEG machines causing reduced total number of patients seen in the 9 years of review. About 160(30.83%) results were not documented, due to weak records filing skills in our institutions in resource poor areas.

CONCLUSION/RECOMMENDATIONS

This study reflects an increased incidence of seizures in males more than 40years old with a slightly more focal pattern of presentation in a resource limited setting. This can be accounted for by increased incidence of traumatic head injuries and stroke in this active population with subsequent socioeconomic consequences. Interictal epileptiform abnormalities were present in 67% of suspected seizure cases, with a slight predominance of focal discharges. Improved access to EEG services is crucial for the prompt diagnosis and effective management of epilepsy in Nigeria. Strengthened health policies, training of EEG personnel, and better record-keeping will enhance epilepsy care and research in resource-limited setting.

ETHICAL APPROVAL

This study involving human participants was reviewed and approved by the Health Research Ethics Committee of the University of Nigeria Teaching Hospital (UNTH), Ituku-Ozalla, Enugu, Nigeria. The ethical approval was granted. All procedures performed in this study were in accordance with institutional guidelines and national regulations governing research involving human subjects.

HUMAN AND ANIMAL GUIDELINES

The study was conducted in full compliance with the ethical principles outlined in the Declaration of Helsinki (2013 revision), which governs research involving human participants. No animal subjects were involved in this study.

CONSENT FOR PUBLICATION

Consent for publication of anonymized data was obtained.

Declaration of Interest: None

REFERENCES

1. Flink R, Pedersen B, Guekht AB, Malmgren K, Michelucci R, Neville B, Pinto F, Stephani U, Ozkara C. Guidelines for the use of EEG methodology in the diagnosis of epilepsy: International League Against Epilepsy. Acta Neurol Scand. 2002;106:1–7.
2. Timpte K, Rosenkötter U, Honrath P, Weber Y, Wolking S, Heckelmann J. Assessing 72 h vs. 24 h of long-term video-EEG monitoring to confirm the diagnosis of epilepsy: a retrospective observational study. *Front Neurol.* 2023;14:1281652. Available from:

https://www.frontiersin.org/articles/10.3389/fneur.2023.1281652/full

3. Fisher RS, van Emde Boas W, Blume W, Elger C, Genton P, Lee P, Engel J Jr. Epileptic seizures and epilepsy: definitions proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). Epilepsia. 2005 Apr;46(4):470–2.
4. World Health Organization. Epilepsy fact sheet [Internet]. 2019 Jun 20 [cited 2025 Oct 8]. Available from: https://www.who.int/news-room/fact-sheets/detail/epilepsy
5. Megiddo I, Colson A, Chisholm D, Dua T, Nandi A, Laxminarayan R. Health and economic benefits of public financing of epilepsy treatment in India: an agent-based simulation model. Epilepsia. 2016 Mar;57(3):464–74. doi: 10.1111/epi.13294.
6. World Health Organization. *Atlas: Epilepsy Care in the World* [Internet]. Geneva: WHO; 2005 [cited 2025 Oct 15]. Available from: https://www.who.int/publications/i/item/atlas-epilepsy-care-in-the-world.
7. Wang Z, Song X, Chen L, Nan J, Sun Y, Pang M, Zhang K, Liu X, Ming D. Research progress of epileptic seizure prediction methods based on EEG. *Cogn Neurodyn.* 2024;18:2731–50. Available from: https://link.springer.com/article/10.1007/s11571-024-10109-w
8. Sirven JI, Shafer PO. Epilepsy and seizures [Internet]. Medscape; 2023 [cited 2025 Oct 14]. Available from: https://emedicine.medscape.com/article/1184846-overview
9. Beniczky S, Trinka E, Wirrell E, Abdulla F, Al Baradie R, Alonso Vanegas M, et al. Updated classification of epileptic seizures: Position paper of the International League Against Epilepsy. *Epilepsia*. 2025 Apr 23. doi:10.1111/epi.18338
10. Smith SJM. EEG in the diagnosis, classification, and management of patients with epilepsy. J Neurol Neurosurg Psychiatry. 2005;76(Suppl II):ii2–ii7. doi: 10.1136/jnnp.2005.069245
11. Biset G, Abebaw N, Gebeyehu NA, Estifanos N, Birrie E, Tegegne KD. Prevalence, incidence, and trends of epilepsy among children and adolescents in Africa: a systematic review and meta-analysis. *BMC Public Health.* 2024;24:771. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-024-18236-z
12. Beghi E. The epidemiology of epilepsy. Neuroepidemiology. 2020;54(2):185–91. doi: 10.1159/000503831. Epub 2019 Dec 18.
13. Paul A, Davies A, Gibbon R, Kobulsky I, Grant L, Chan KY. An estimate of the prevalence of epilepsy in Sub-Saharan Africa: a systematic analysis. J Glob Health. 2012 Dec;2(2):020405. doi: 10.7189/jogh.02.020405