



Pattern of Childhood Seizure Disorder and Inter-Ictal Electroencephalographic Correlates among Children in Sokoto, Nigeria

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ABSTRACT

Background: Seizure disorder (epilepsy) is a common chronic neurological disorder in the pediatric age group, with both medical and psycho-social significance, particularly in Africa; where it is still linked to evil spirits and supernatural powers. **Objective:** To determine the pattern of pediatric epilepsy and inter-ictal EEG correlates in Sokoto, Nigeria. **Materials and Methods:** It is a descriptive retrospective study, using designed proforma to record each patient's biodata and relevant clinical histories pertaining to the seizures. All consecutive patients with seizure disorder attending pediatric neurology clinic in Usmanu Danfodiyo University Teaching Hospital Sokoto were enrolled. Proportions of cases with and without epileptiform discharges on the EEG recordings were analyzed, using SPSS. **Results:** Total 303 cases of seizure disorder (epilepsy) were studied, constituting 47.2% of all pediatric neurology cases, 642 were seen in the clinic over the period. The mean age of the cases was 6.1 ± 4.5 years (range 3 months to 15 years). Infants accounted for 18.2% of the cases. Male to female ratio was 1.9:1. Generalized tonic-clonic seizures were the most frequent clinical seizures recorded (63.4%), followed by myoclonic forms (11.9%). Absence seizure was the least observed type (1.0%). Only 176 (58.1%) of the patients had the EEG test, out of which 146 (83%) showed epileptiform features in keeping with epilepsy. Cerebral palsy was the commonest identifiable risk factor for epilepsy among the cases. **Conclusion:** Epilepsy remains a significant pediatric neurologic problem in Nigeria. EEG has a good yield of epileptiform abnormalities among children with active seizure disorder. It, therefore, helps in complementing the clinical history and eventual diagnosis.

Keywords: Pattern, Pediatrics, EEG-correlates, Seizure disorder, Sokoto

INTRODUCTION

Seizure disorder (epilepsy) is one of the common chronic neurological disorders in the pediatric age group. It has both medical and psycho-social significance, especially in Africa; where it is still linked to evil spirits and other supernatural powers [1].

The diagnosis of epilepsy is mainly based on clinical history from an eyewitness account or from a home video recording using a video camera or a mobile phone camera, which is becoming a very important tool in the evaluation and subsequent management of paroxysmal disorders [2,3]. However, the history may be unclear or some unusual postures and atypical movements may be involved, making it difficult to differentiate from other paroxysmal events. Thus, EEG becomes a very important, indispensable diagnostic tool.

The primary purpose of electroencephalography (EEG) in epileptology is to detect brain epileptiform discharges which would suggest seizure activity, thus, establishing the diagnosis of epilepsy in a patient with positive clinical history [4].

Other clinical applications of the EEG include: differentiating focal onset from generalized seizures, identification of some epileptic syndromes, localization of epileptogenic zone, evaluation of background cerebral function, identification of encephalopathies including non-convulsive status and for follow-ups [2,5,6]. The EEG can also have a valuable contribution in distinguishing absence seizures (particularly those associated with automatisms and atypical

forms) from complex partial seizures, which are often difficult to differentiate clinically [4]. This will ultimately guide the choice of antiepileptic medication(s) and in the prediction of the long-term prognosis.

The routine EEG procedure is a safe and painless method of brain study with no adverse effects [2]. Its potential consequence only lies in its misinterpretation, especially when the EEG result is interpreted out of context of the patient's clinical history, leading to inappropriate diagnosis and wrong treatment. Therefore, clinicians should always treat the patient and not 'the EEG'; except in occasional situations of epilepsy without obvious convulsive seizures such as non-convulsive status, Landau-Kleffner syndrome and continuous spike-wave discharges during slow wave sleep, where seizure evidence is only on the EEG recording [4].

Electrical (non-convulsive) seizures have been reported in up to 72% of cases of seizures among critically ill children admitted into an intensive care unit, who were on continuous EEG monitoring [7]. Therefore, the objective of this study is to determine the pattern of pediatric seizure disorders and the EEG correlates among children with a seizure disorder in Sokoto, Nigeria.

PATIENTS AND METHODS

Study Design

A descriptive retrospective study of the clinical seizure types and EEG epileptiform findings of patients with epilepsy seen in the Pediatric Neurology Clinic of Usmanu Danfodiyo University Teaching Hospital (UDUTH) Sokoto was done, over a 44 months period (January 2014 to August 2017). Neonatal seizures and neonatal epileptic syndromes were not included in this study and cases with incomplete records were excluded.

A designed proforma was used to record each patient's biodata and relevant clinical history pertaining to the seizures. Descriptive report of the clinical seizure types and inter-ictal EEG findings were recorded for each patient. All EEGs were done at the nearby Federal Neuropsychiatric Hospital, Kware by a trained EEG technician. Each EEG recording took 30-45minutes, taken in either awake or sleep/sedated states, depending on the child's age and ability to cooperate. The proportion of cases with and without epileptiform discharges on the EEG was analyzed using SPSS version 20. A p-value of less than 0.05 was considered statistically significant. Ethical approval was sought and obtained from the UDUTH's Health Research and Ethics Committee.

RESULTS

Of the 642 cases seen in the Pediatric Neurology clinic over the period, 303 (47.2%) cases were those of seizure disorder (epilepsy). The mean age of the cases was 6.1 ± 4.5 years (range 3 months to 15 years). Infants accounted for 18.2% of the cases. The male to female ratio of the subjects was 1.9:1. Generalized tonic-clonic seizures were the most frequent clinical seizures reported (63.4%), followed by myoclonic forms (11.9%) as shown in Table 1. Absence seizure was the least observed types in 1.0% of the cases.

Table 1 Distribution of Paediatric epileptic seizures as seen in UDUTH Sokoto

| Seizure type | No. of cases (N) | Percentage (%) |
|---------------------------|------------------|----------------|
| Generalized -Tonic-Clonic | 192 | 63.4% |
| Myoclonic Forms | 36 | 11.9% |
| Mixed Forms | 31 | 10.2% |
| Complex Partial Seizures | 18 | 5.9% |
| Atonic | 9 | 3.0% |
| Simple Partial | 7 | 2.3% |
| Absence | 3 | 1.0% |
| Epileptic Syndromes | 7 | 2.3% |
| Total | 303 | 100 |

The 7 cases identified as epileptic syndromes were infantile spasms/West syndrome (2 cases), Rolandic seizures (3 cases), Doose syndrome (1 case) and Lennox gastaut syndrome (1 case).

Majority of the patients (68%) were on anticonvulsant monotherapy with carbamazepine (53.1%), sodium valproate (36.0%) or phenobarbitone (10.9%), while 32% were on two or more anticonvulsant medications due to poor response to initial monotherapy.

Only 176 (58.1%) of the patients had the EEG test done, out of which 105 (59.8%) were awake EEGs and 71 (40.2%) were sedated/sleep EEGs. Up to 146 (83%) of all the EEG recordings showed epileptiform discharges in keeping with a seizure disorder. There was a significant relationship between the occurrence of epileptiform features and myoclonic seizures ($r=0.68$, $p=0.02$), as well as GTC seizure types ($r=0.57$, $p=0.04$). However, there was no gender difference in the occurrence of epileptiform abnormalities ($p>0.05$). Cerebral palsy was the commonest identifiable clinical risk factor/co-morbidity among the cases.

DISCUSSION

Pediatric seizure disorder is still a very common neurological presentation in our center, constituting nearly half of all neurologic cases seen at the clinic. This is in agreement with previous reports from other tertiary centers in Southern Nigeria [8,9]. Males are affected more than females; similar to earlier reports in Nigeria [8-11]. The exact reason for male predominance is not clear.

The generalized tonic-clonic seizure was the commonest clinical type noted in our study, as reported earlier by Ahmed, et al., in Sokoto, Lagunju, et al., in Ibadan and Olisah, et al., from Zaria [8,10,11]. This may be due to the fact that majority of childhood epilepsies are primary/idiopathic, thus majority will present as generalized seizures (GTC) rather than specific lesion/region related focal seizures [11].

Absence seizure was the least observed seizure among our subjects. This is a similar finding by Ahmed, et al., over two decades ago from the same center [11]. This may be due to its subtle and brief presentation, making its detection difficult by the caregivers. More so, the affected children may not be able to report its occurrence due to their tender age, a majority of the affected children in our study were below 5 years of age.

Electroencephalography is an indispensable investigative tool in the evaluation of childhood epilepsies, although a normal result does not rule out seizure disorder particularly with the routine inter-ictal EEGs that are most commonly utilized. However, the presence of an EEG abnormality in addition to a relevant clinical history usually establishes the diagnosis especially when it is correlated with the clinical presentation [2,12]. Lagunju, et al., have observed a high risk of misdiagnosis of seizure type (generalized vs localization-related) in the absence of an EEG, leading to the use of inappropriate therapies in children with epilepsy [8].

Only 58% of our subjects were able to do the EEG test due to financial constraints among other reasons. This is comparable to the 61% reported by Ogunlesi in Sagamu [13]. The yield of epileptiform abnormalities in our study was high (83%) as compared to some previous local and international reports [10,14,15]. It is, however, lower than reports by Lagunju, et al., and Ogunlesi both from South-Western Nigeria [8,13].

The high yield of epileptiform discharges in our study may be due to the fact that most of the subjects were still having active seizures; thus, a short interval between the last seizure episode and the timing of the EEG recording. It has been reported that epileptic children generally have higher rates of epileptiform discharges on EEG than the adults, and a single 30-minute EEG may demonstrate epileptiform activity in about half of all children with epilepsy [4,16]. This could be enhanced by serial recordings, sleep deprivation, sleep studies or prolonged inter-ictal EEG monitoring [2,4,5].

Leach, et al., and DeRoos, et al., have demonstrated the superiority of sleep-deprived EEG over both routine awake and drug-induced sleep EEG recordings, in increasing the yield of epileptiform abnormalities in the inter-ictal EEGs of patients with suspected epilepsy [17,18]. Different studies have reported varied rates of detectable EEG abnormalities including epileptiform abnormalities ranging from 53% to 94% [8].

Jan, in Saudi Arabia has reported that up to 3.4% of 438 children with epilepsy revealed unexpected EEG findings that completely changed their management [15]. Although we did not demonstrate similar finding in our study, possibly due to relatively fewer subjects with EEG test, their finding underscores the utility of EEG studies in the evaluation of epilepsy and other CNS disorders including various forms of encephalopathy, sleep and personality disorders [6,19].

CONCLUSION

In conclusion, epilepsy remains a significant pediatric neurologic problem in our region. Inter-ictal EEG has a good yield of epileptiform abnormalities among children with active seizure disorder. It, therefore, helps in complementing the clinical history and in excluding non-epileptic attack disorders.

RECOMMENDATION

It is hereby recommended that there is the need to make EEG machines more available in our tertiary centers considering its importance in the evaluation of patients with epilepsy and other neurologic dysfunctions.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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