Original article

Role of sleep deprived EEG in undiagnosed epileptic patients with negative standard EEG

Zia Ul Haq[1], Tahira Liaquat[2], Tahir Bashir[3], Muhammad Anas Bashir[4], Anam Khan[5], Shazia Siddique[6], Seemeen Hussain[7]

[1]Senior Registrar Sir Ganga Ram Hospital, Lahore, [2]Postgraduate Registrar, Department of Pathology Services Hospital, Lahore, [3]Associate Professor Department of Medicine, Fatima Jinnah Medical University, Sir Ganga Ram Hospital, Lahore, [4]Senior Registrar Sir Ganga Ram Hospital, Lahore, [5]Postgraduate Registrar, Sir Ganga Ram Hospital, Lahore [6]Assistant Professor, Department of Medicine, Fatima Jinnah Medical University, Sir Ganga Ram Hospital, Lahore, [7]Professor of Medicine Fatima Jinnah Medical University/Sir Ganga Ram Hospital, Lahore-Pakistan

Correspondence to: Dr. Zia Ul Haq, Email: idrzia@yahoo.com

ABSTRACT

Background: Epilepsy is a common illness and most of the times it is diagnosed with standard electroencephalography (EEG). However, this is not positive in all the patients. Among these patients sleep deprived EEG is recommended by many authors but this is not routinely used. This study was conducted to evaluate that how commonly sleep deprived EEG will show positive results among patients with unspecified seizures having negative standard EEG.

Patients and methods: This was a cross sectional survey that included 100 patients with unspecified seizure having negative standard EEG. All the patients had sleep deprived EEG. The frequency of patients positive for epilepsy on sleep deprived EEG was calculated.

Results: Forty one (41%) patients were found positive for epilepsy on sleep derived EEG, while rest of 59 (59%) patients were negative.

Conclusions: it is recommended that all the patients with unspecified seizures having negative standard EEG should have sleep deprived EEG in our clinical setup.

Keywords:

Epilepsy; standard EEG; sleep deprived EEG

INTRODUCTION

Among all neurological disorders, epilepsy is one of the most disruptive one. It's a chronic disorder with high prevalence rate. Almost 50 million peoples are suffering from epilepsy worldwide[1,2]. In United State estimated 150,000 adult population presents to hospital with unprovoked first seizure[3]. A rough data from Pakistan showed epilepsy prevalence around 9.99/1000 population[4]. Seizures occurs due to periodic abnormal electrical changes in brain function due to underlying central nervous system (CNS) disorder that can results in altered level of consciousness, behavioral, motor, sensory or autonomic changes. Seizures are characterized by abnormal movements with or without loss of consciousness.[5] It usually needs detailed investigation and treatment plan. There is an emphasis on early diagnosis and treatment of epilepsy because delaying in diagnosis may result in deterioration in quality of life and emergence of comorbid diseases which may complicate the course of disease.[6] The diagnosis of epilepsy is always challenging. Obtaining thorough history and performing complete general and neurologic examination are very important in confirming the diagnosis and finding the cause.[7] Clinical assessment of epileptic abnormalities in a patient can help the clinician to reach the correct diagnosis and further categorization into its subtypes.[8]

Electroencephalography is of great importance in diagnosis and monitoring of prognosis of many neurological and non-neurological illnesses. It has been observed that almost 50% of patients clinically labelled as epilepsy show normal EEG.[9] According to clinical practice guidelines repeat EEG should be performed in sleep deprivated patients with initial normal EEG.[10] Sleep deprived EEG is considered superior to standard EEG in the diagnosis of unspecified seizures.[11-15]Around 13% cases with unspecified seizures having negative standard EEG were found to be positive when undergone sleep deprived EEG.[16-19]

The purpose of this study was to find out whether sleep deprived EEG has a higher diagnostic yield in comparison with usually performed EEG for the diagnosis of epilepsy. If the frequency of positive sleep deprived EEG for the epilepsy is found higher, then it may be recommended that all patients of unsuspected seizures should undergo sleep deprived EEG to avoid misdiagnosis of epilepsy, so that appropriate treatment should be given to all epileptic patients.

Conflict of interest: The authors declared no conflict of interest exist.

Citation: Haq ZU, Liaquat T, Bashir T, Bashir A, Khan A, Siddique S, Hussain S et al. Role of sleep deprived EEG in undiagnosed epileptic patients with negative standard EEG. J Fatima Jinnah Medical Univ. 2019; 13(3): 107-109.

DOI: https://doi.org/10.37018/jfjmu.v13i3.678

PATIENTS AND METHODS

One hundred Patients presenting to outdoor and indoor Department of Medical Unit III of Sir Ganga Ram Hospital, Lahore during June 2006 to November 2006 were recruited. After detailed history, the patients were explained whole procedure and informed consent and demographic profile (name, age, sex, address) was taken. After 10 hours sleep deprivation (patients were not allowed to sleep for 10 hours) Then these cases were undergone sleep deprived EEG (a procedure of half an hour) to determine the positive cases of epilepsy by the same team. Most of the patients had history 2-3 episodes of seizure before presentation. Mean duration between first episode of seizure and standard EEG was 7 days. All of them underwent standard EEG only once. Mean duration between standard EEG and sleep deprived EEG was 24-30 hours. No patient was taking any kind of antiepileptics. Sleep deprived EEG was performed in morning in all patients. Patients with generalized tonic clonic seizures were included in this study while all other seizures types and less than 6 year age patients were excluded from this study. Both EEGs were interpreted by experienced neurologist for epileptiform discharges (spikes, polyspikes, sharp waves, sharp-slow waves or spike-slow waves).

All data was recorded through specially designed questionnaire. The data was entered and analysed through SPSS 10. Age was presented as mean ± SD. Gender and outcome (i.e. positive cases of epilepsy) was presented as frequency and percentage.

RESULTS

The Hundred patients were involved in the study irrespective of gender. The mean age of the patients included in the study was 19.20±10.17 years [range 7-40]. Among them 46 were 6-15 years old, while 54 were 16-40 years old. Male to female ratio was 1:1.1. Mean duration between first episode of seizure and standard EEG was 7 days. Mean duration between standard EEG and sleep deprived EEG was 24-48 hours. All of them underwent standard EEG only once. None of the patients was on any kind of medication. Standard EEG was negative for any kind of epileptic activity. Out of the 100 patients in the study, there were 41 (41%) patients in whom the results were positive for epilepsy and in 59 (59%) patients; the results were negative for epilepsy.

DISCUSSION

This study was done in a general medical ward to determine the frequency of patients who were positive for epilepsy on sleep deprived EEG with unspecified seizures having negative standard EEG. The results of this study showed a higher prevalence (41%) of epilepsy on sleep deprived EEG recording.

In a study by Shaher et al, out of fifty five children, 15 children (27.2%) showed the positive result with sleep deprived EEG. Their initial EEGs were found to be normal. Like our study, this study showed a higher frequency of detection of epileptic discharge i.e. 27%. However, this was lower than ours i.e. 41%. Moreover, this study included children of mean age 10 ± 3.7 years, with almost equal ratio of male to female. A study done by Geuta et al. showed sensitivity of sleep deprived EEG in 104 patients was around 45%.[16] Another study conducted by Gustafsson et al. observed that 36% of patients showed epileptiform discharges after sleep deprivation.[17] However Roland Renzel found positive sleep deprived EEG in 25% of the patients.[18] Leach et al found out that routine EEG and drug induced EEG had sensitivity of 44% and 58% respectively.[20] while sleep deprived EEG had sensitivity of 92%.

The major limitation of this study was small sample size from a single medical ward. In addition we could not rule out the effect of sleep deprivation on EEG changes. The above discussion reflects that frequency of the detection of epilepsy on sleep deprived EEG is variable in different studies (i.e. from 22.6% to 92%). [16-20] Therefore, we need more studies on larger scale to document actual results.

CONCLUSIONS

The frequency of detection of patients positive for epilepsy on sleep deprived EEG with unspecified seizures having negative standard EEG is high in our study. So, it is recommended that all the patients with unspecified seizures having negative standard EEG should have sleep deprived EEG in our clinical setup.

REFERENCES

1. Katchanov J, Berbeck GL. Epilepsy care guidelines for low and middle income countries. BMC Medicine. 2012, 10:107.
2. Mohammadi MR, Ghanizadeh A, Davidian H, Mohammadi M, Norouzian M. Prevalence of epilepsy and comorbidity of psychiatric disorders in Iran. Seizure. 2006;15:476-82.
3. Hauser WA, Beghi E. First seizure definitions and worldwide incidence and mortality. Epilepsia. 2008;49(suppl 1):8–12.
4. Khatri IA, Iannaccone ST, Ilyas MS, Abdullah M, Saleem S. Epidemiology of Epilepsy in Pakistan, A review of literature. J Pak Med Assoc. 53:594:2003.)
5. Fisher RS, Acevedo C, Arzimanoglou A, Bogacz A, Cross JH, Elger CE, et al. ILAE official report: a practical clinical definition of epilepsy. Epilepsia. 2014;55(4):475-82. https://doi.org/10.1111/epi.12550.

6. Shabani A, Dashti B, Teimoori H. Frequency of psychiatric comorbidities in epilepsy in an Iranian sample. Iran J Psychiatry. 2006; 1: 148-152.
7. Keihani Z, Haghshenas Z, Daneshjou K, Azarfar A. Comparative evaluation of eegs with and without sleep deprivation in diagnosis of childhood epilepsy. Acta Medica Iranica. 2005; 43: 147-150.
8. Chan W, Kwong KL, Wong WW, Kwong N. Which electroencephalography for seizures?: Survey performed in electro-medical diagnostic unit. HK J Paediatr. 2010; 15: 19-23.
9. Krumholz A, Wiebe S, Gronseth G, Shinnar S, Levisohn P, Ting T, et al. Practice parameter: evaluating an apparent unprovoked first seizure in adults (an evidence-based review): Report of the Quality Standards Subcommittee of the American Academy of Neurology and the American Epilepsy Society. Neurology. 2007;69(21):1996-2007.
10. Beghi E, De Maria G, Gobbi G, Veneselli E. Diagnosis and treatment of the first epileptic seizure: guidelines of the Italian league against epilepsy. Epilepsia. 2006; 47: 2–8.
11. Askamp J, van Putten MJAM. 24 h in-home EEG after a first seizure in adults. Neurophysiol Clin Neurophysiol. 2010: 43(1);73.
12. Giorgi FS, Perini D, Maestri M, Guida M, Pizzanelli C, Caserta C, et al. Usefulness of a simple sleep-deprived EEG protocol for epilepsy diagnosis in de novo subjects. Clin Neurophysiol. 2013:124;2101-2107.
13. Leone MA, Vallalta R, Solari A, Beghi E, FIRST Group. Treatment of first tonic-clonic seizure does not affect mortality: long-term follow-up of a randomised clinical trial. J Neurol Neurosurg Psychiatry. 2011: 82;924-927.
14. Askamp J, Van Putten MJ. Diagnostic decision-making after a first and recurrent seizure in adults. Seizure. 2013: 22(7);507-511. https://doi.org/10.1016/j.seizure.2013.03.012
15. Leach JP, Stephan LT. Which electroencephalgoraphy for epilepsy? The relative usefulness of different EEG protocols in patients with possible epilepsy. Nat Clin Pract Neurol. 2007; 3: 128-129.
16. Geuta I, Weeninka S, Knottnerusa ILH, van Putten MJAM. Detecting interictal discharges in first seizure patients: ambulatory EEG or EEG after sleep deprivation? Seizure 2017. 51;52–54. https://doi.org/10.1016/j.seizure.2017.07.019
17. Gustafsson G, Broström A, Ulander M, Vrethem M, Svanborg E. Occurrence of epileptiform discharges and sleep during EEG recordings in children after melatonin intake versus sleep-deprivation. Clin Neurophysiol. 2015; 126(8):1493-7. https://doi.org/10.1016/j.clinph.2014.10.015
18. Renzel R, Baumann CR, Poryazova R. EEG after sleep deprivation is a sensitive tool in the first diagnosis of idiopathic generalized but not focal epilepsy. Clin Neurophysiol. 2016;127(1):209-213. doi: https://doi.org/10.1016/j.clinph.2015.06.012.
19. Boggs W. Sleep deprived EEG increase diagnostic yield for new epilepsy. J Neurol Neurosurg Psych. 2006; 77:1040-1042.
20. Leach JP, Stephen U, Salveta C, Brodie MJ. Which EEG for epilepsy? The relative usefulness of different EEG protocols in patients with possible epilepsy. J Neurol Neurosurg Psychiatry. 2006; 77: 1040-1042.