Available online on www.ijpqa.com
International Journal of Pharmaceutical Quality Assurance 2019; 10(1); 114-118

ISSN 0975 9506

Research Article

Interictal Electroencephalogram Changes in Patients with Seizure Disorder in Al-Basrah General Hospital

Suroor Mohamed Dahiam*, Farah Nabil Abbas, Ahmed Abdaljawad Salim

Department of Medical Physiology, College of Medicine, University of Basrah, Iraq

Received: 10th Oct, 18; Revised: 21st Dec, 18, Accepted: 27st Feb, 19; Available Online: 25th Mar, 2019

ABSTRACT

The epilepsy is a chronic neurological disorder characterized by recurrent spontaneous seizure, accompanied by neurophysiological, cognitive, psychological and behavioral changes. It is one of the most common neurological disorders in the world that impacts about fifty million of the population globally in all age groups comprising .The aim of this study was to establish the EEG sensitivity in the diagnosis and identify different changes in different seizure disorder in Al-Basrah city. Assistance in define specific epilepsy syndrome which can support our health care services to provide a proper management in our providence. This study was a case-control study dealing with a total of 220 (male and female) subjects, 110 of them as the group presented with unprovoked seizure and the other 110 considered as a control group done during the period from February 2017 to September 2017. EEG was performed for 20 minutes duration and activation procedures were done. The result of this study shows the normal EEG in 41 of cases while the abnormal finding in 69 patients, interictal epileptiform discharges represented by 34.5% focal changes and 28.2% generalized changes. The results showed a sensitivity of 62.7% and a specificity of 100%. The epileptic patients had a positive family history of epilepsy. Time of last seizure to EEG performed was a significant factor to detect epileptic discharge. Used within first days from seizure time to promote detection of EEG abnormalities. Epileptic discharges noticed mainly in children and adolescent with male predominantly in our province.

Keywords: Interictal Electroencephalogram; chronic neurological; epilepsy; EEG.

INTRODUCTION

Epilepsy is a brain disorder defined through any of the subsequent situations: Two of unprovoked seizure happen as a part of more than 24 hours at a minimum. One unprovoked (or reflex) seizure and a chance of a further seizure, occurring over the ten years, analogous to general recurrence risk (at least sixty percent) after two unprovoked seizures and/ or diagnosis of an epilepsy syndrome. Epilepsy is express to be resolute for individual who had an age dependent epilepsy syndrome or those who have continued seizure free for ten years at least with off anti-seizure drugs for minimum five years[1]. seizure result from abnormal, synchronous potentiation of groups of a neuron, Seizures usually continue for few seconds or minutes and may be as long as thirty minutes termed as status epileptics[2]. The International League Against Epilepsy ILAE determined" an Epileptic Seizure is a transient occurrence of signs and or symptoms due to abnormal excessive or synchronous neuronal activity in the brain"[3]. Seizures are symptoms occur in the acute state (provoked seizure) or in epilepsy (unprovoked seizure) whereas the Epilepsy is a neurological disorder of spontaneous recurrence of unprovoked seizure is an essential symptom[4]. Epilepsy syndrome used by ILEA to refer to "a complex of signs and symptoms that define a unique epileptic condition" which is a specific collection of clinical seizure type (s), EEG finding, clinical features as the age of onset, the course of epilepsy and neurological features[5]. The cerebral cortex is occupied by multiple types of neurons either excitatory or inhibitory, the excitatory pyramidal neurons are the main source of almost cortical output, whereas the cortical inhibitory neurons constitute principally local connections with regulating cortical output[6]. The neuronal firing of epileptic seizure included too much of excitation of the neuron over to the inhibition one resulting in the abnormal release of neuronal synchronization and[7] The principle excitatory neurotransmitter is Glutamate while the primary inhibitory neurotransmitter is GABA in the human brain[8]. The generation of generalized Spike-wave on EEG a raised from the interaction between cortex and thalamus with distribution to involved both hemispheres, the thalamic GABA-ergic neurons can burst to fire with the creation of action potential via specific calcium channels that's lead to excitation of corticothalamic which gives rise to spike – wave on EEG[9]. The German psychiatrist, Hans Berger, in 1922 who is discovered the human EEG[10]. An electroencephalogram is one of the essential devices for determination and investigation of epilepsy. EEG is the recorded description of electrical activity delivered by the terminating of neuron inside the brain along the scalp[11]. The most popular classification is EEG waveform frequency used which are: Alpha, Beta, Theta, and Delta waves[12]. EEG signals for waveform frequencies shows

Author for Correspondence: drsuroormd@gmail.com

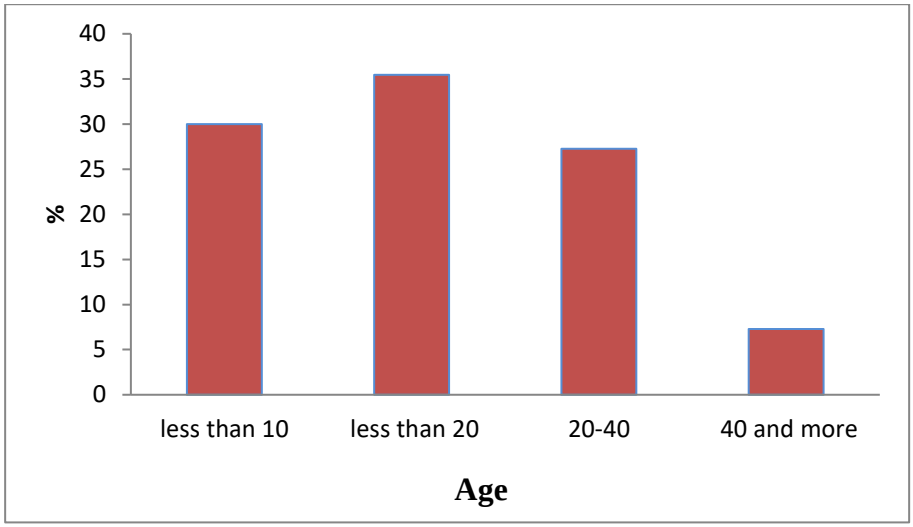

Figure 1: Age of epileptic patients.

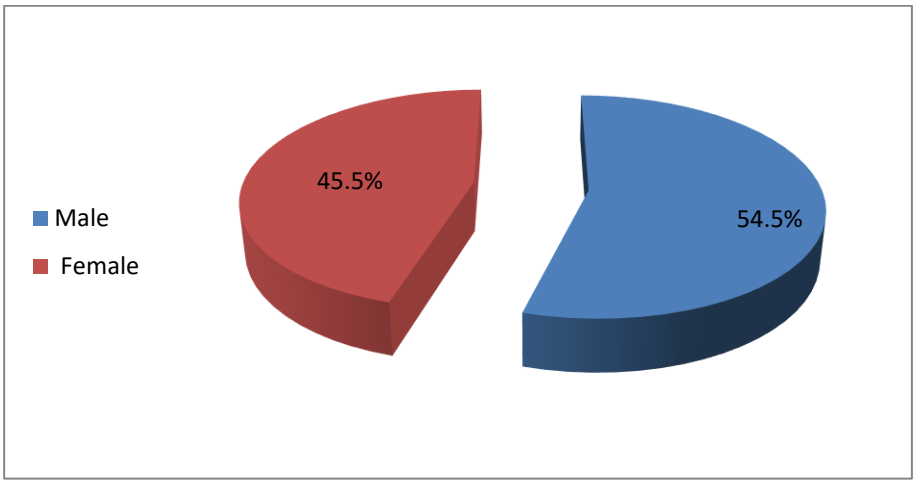

Figure 2: Distribution of patients by gender.

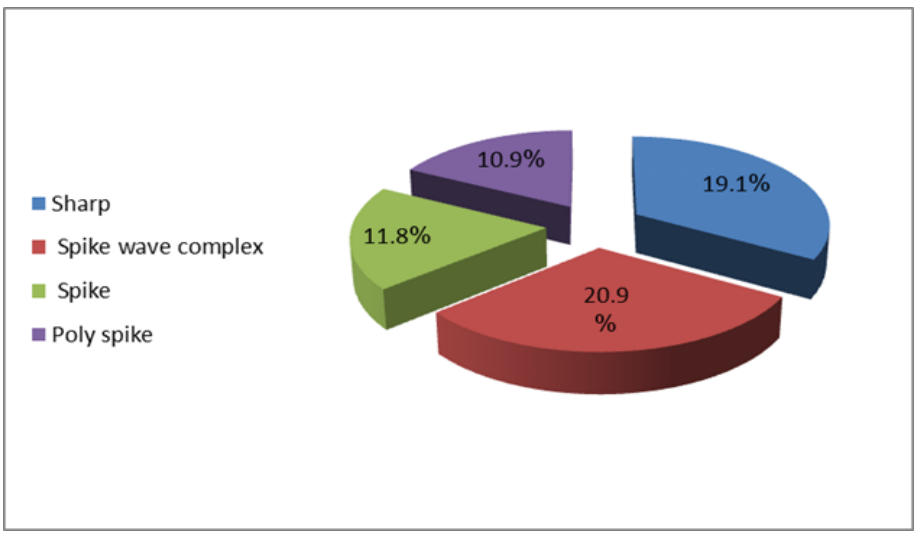

Figure 3: Interictal epileptiform discharges in patients.

different frequency bands classified as: Delta (up to 4 Hz), Theta (4 – 8 Hz), Alpha (8 – 16 Hz), Beta (16 – 32 Hz), and Gamma (higher than 32 Hz)[13].

MATERIALS AND METHODS

This research work considered as a case-control study carried out in the period from February 2017 to September 2017 in the consultant unit of neurology /Al-Basra General Hospital and referred to the EEG clinic. It was conducted on 220 persons, 110 patients and 110 normal control with

Table 1: The EEG outcomes compared to clinical diagnosis.

		Clinical Diagnosis		Total
		Cases	Control	
EEG findings	Positive	69	0	69
	Negative	41	110	151
Total		110	110	220
Sensitivity		69/110*100		62.72%
Specificity		110/110 * 100		100%

age group of mean age for all participators, mean ±SD (17.08±11.32). The participators were categorized into four groups according to age: (14) and (15)

Group 1: This age group from 1 to less than 10 years. (Childhood age)

Group 2: Included age from 10 to less than 20 years. (Adolescent age)

Group 3: From 20 to less than 40 years (Adult age)

Group 4: From 40 years and more

All patients and control persons either adults or children with their relatives were informed about the study and taken their agreements for participation by obtaining written consents.

Inclusion criteria

Patients with a clinical diagnosis of epilepsy proved by senior neurologist as unprovoked seizure

New cases of epilepsy, not on antiepileptic drugs (AEDs) treatment.

Normal laboratories investigation.

Exclusion criteria

Any patients who had been proved that they don't have a true seizure disorders (seizure mimic: example as psychogenic seizure).

Patients with abnormal blood investigations, example: abnormal liver function tests, abnormal blood sugar, electrolyte disturbances and increased urea and creatinine level.

Abnormal brain imaging either CT or MRI.

According to the international system of 10-20 system at a standard distance from one electrode to another either 10 % or 20%. This system measuring the area from the (nasion to the inion) through use of anatomical landmarks on the skull. The designated of electrodes placing as the odd numbers were on the left while those with even numbers put on the right side[11]. We recorded the EEG at rest when the subject is seated relax in a dark room , instructed the person to close his / her eyes for 10-15 minutes and then the activation procedure of Hyperventilation was performed for about 3 minutes duration by asking the patients to take deep breathing of about nearly 16 cycles per minute with considerible attention to exclude respiratory and heart problems. The photic stimulation used for about 30 seconds period of frequency 10-15 Hz of light at intermittent flashing light placed in front of patients closed eyes.

Statistical Analysis

Data were expressed as the means of three independent experiments. Statistical comparisons of the results were performed by Chi-square test using SPSS ver.23[16].

RESULT

The mean age of epileptic patients was 17.08±11.32 years with a range from (1-52); while it was17.21 ±9.89 years for the control, the sub grouped of cases by age as in figure 1 and gender as in figure 2.

Types of interictal epileptiform discharges (IEDs) in epileptic patients

The highest number and percentage of IEDs were spike-wave complexes followed by sharp waves, spike and then poly spikes in descending order 23 (20.9%), 21 (19.1%), 13 (11.8%) and 12(10.9%) respectively as figure 3.

Some of Iraqi studies related to EEG In Epilepsy

There were multiple and different of studies and articles concerning in Epilepsy and EEG, the results were different to our study corresponding to an inconstant in methodology and population sample size involved to study as shown below.

Table 2: EEG changes and Epilepsy clinical factors.

Variable		EEG changes		P Value
		Normal EEG Number (%)	Abnormal EEG Number (%)	
Age group (year)	group I	7 (17.1%)	26 (37.7%)	0.026
	group II	14(34.1%)	25 (36.2%)	
	group III	14 (34.1%)	16 (23.2%)	
	group IV	6 (14.7%)	2 (2.9%)	
Gender	Male	21 (51.2%)	39 (56.5%)	0.693
	Female	20 (48.8%)	30 (43.5%)	
Family History	Negative	21 (51.2%)	25 (36.2%)	0.041
	Positive	20 (48.8%)	44 (63.8%)	
Time from last seizure	First day	14 (34.1%)	29 (42.0%)	0.001*
	Second day	4 (9.8%)	32 (46.4%)	
	Third day	13 (31.7%)	6 (8.7%)	
	4^{th} -10 days	10 (24.4%)	2 (2.9%)	
Activation procedures	Hyperventilation	81(88.04%)	11 (11.96%)	0.001*
	Photic stimulation	89 (96.7%)	3 (3.26%)	0.001*

Table 3: Iraqi articles concerning with EEG in epilepsy.

Iraqi city	Title	EEG finding	EEG changes
Babylon	Etiologies of Adult Onset Epilepsy: Clinical and Para clinical Study in the Governorate of Babylon (17)	57.3% positive 42.7% normal	
Baghdad	Risk factors and Neurological Disability Associated with Epilepsy in Iraqi Children (18)	Positive in 99.972% Normal in 0.028%	Generalized in 79.45% Focal 17.29%
Baghdad	The significance of EEG recording in confirming the diagnosis of epilepsy in cases referred for the 1st time(19)	57.4% Positive 42.6% Negative	
Ramadi	Epilepsy in Children: Unusual Presentations (20)	83.33% positive	Generalized spike wave complexes and polyspikes

DISCUSSION

The mean age of epileptic patients in our research was (17.08±11.32) years which was near study of Saudi Arabia[21] that reported the mean age was (19± 14.7) years. Greater than half of the patients involved in this study had positive family history of epilepsy, this finding was consistent with[22] who designated that majority of epileptic patients had at least one member affected by epilepsy irrespective to the type of epilepsy syndrome. EEG test was done within first day up to 10 days of epileptic fit, since the detecting of IEDs was higher in earlier time from attack than later according to[15]. The patients in the awake state had EEG with standard activating procedures that usually include hyperventilation and photic stimulation. Hyperventilation had a significant association with the presence of IEDs, these findings were similar to other studies. Also, photic stimulation had a significant association with the presence of IEDs which consistent with[23,24] The sensitivity in the present study was(62.72%) and specificity (100%) these result were parallel to value found in a study was done in Bangladesh by[25] was (66%)and (100%) respectively. The epileptic patients classify depending on clinical diagnosis and EEG. We had 110 patients, 70.9% of them had generalized semiology by history and 29.1% had focal semiology whereas, about EEG, the changes had been noticed as following:

Generalized epileptiform activities were present in (28.3%)

Focal epileptiform discharges were found in (34.5%)

Normal EEG in (37.2%)

These results were analogous to other studies[26] who expressed that 70% of epileptic patients had generalized clinical epilepsy while on EEG 55% as focal IEDs changes. Most of patients represented as generalized tonic clonic these finding analogues to the studies as[27] Spike-wave complexes and sharp wave were the main IEDs in this study which was parallel to[23] and sharp wave the second common. The polyspike wave mainly generalized distribution with myoclonic seizure type and this was agree with[23] the epileptiform discharge distributed in children and adolescent greater than an adult with a significant difference between them, that was consistent with[28].

CONCLUSION

The EEG measuring was achieved to augment the interictal discharges and epileptiform activities. So, EEG used as a routinely neurodiagnostic device in seizure disorder and epilepsy. Epileptic discharges noticed mainly in children and adolescent with male predominantly in our province. Utilized within first days as early as possible from seizure time to promote detection of EEG abnormalities.

REFERENCES

1. Fisher RS, et al. 2014. ILAE Official Report: A practical clinical definition of epilepsy. Epilepsia. 55(4):475-82.
2. Scharfman HE. 2007. The Neurobiology of Epilepsy. Current neurology and neuroscience reports. 7(4):348-54.
3. Fisher RS, et al. 2005. Epileptic Seizures and Epilepsy: Definitions Proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). Epilepsia. 46(4):470-2.
4. Pohlmann-Eden B, et. al. 2006. The first seizure and its management in adults and children. BMJ : British Medical Journal. 332(7537):339-42.
5. Panayiotopoulos CP. 2012. The new ILAE report on terminology and concepts for the organization of epilepsies: critical review and contribution. Epilepsia. 53(3):399-404.
6. Kim EJ, et. al. 2015. Three Types of Cortical L5 Neurons that Differ in Brain-Wide Connectivity and Function .Neuron. 88(6):1253-67.
7. Silbert BI, et al. 2015. Evidence for an excitatory GABAA response in human motor cortex in idiopathic generalised epilepsy. Seizure. 26(Supplement C):36-42.
8. Brodie MJ, et al. 2016. Epilepsy, Antiepileptic Drugs, and Aggression: An Evidence-Based Review. Pharmacological Reviews. 68(3):563-602.
9. Avoli M. 2012. A brief history on the oscillating roles of thalamus and cortex in absence seizures. Epilepsia. 53(5):779-89.
10. Niedermeyer E, da Silva FL. 2005. Electroencephalography: basic principles, clinical

applications, and related fields. 5th ed: Lippincott Williams & Wilkins.
11. William. 2014. Handbook of EEG Interpretation. second ed. William O. Tatum I, DO, editor. NewYork USA: Demos Medical NewYork, LLC; 361 p.
12. Rana AQ, Ghouse AT, Raghav Govindarajan M. 2017. Neurophysiology in Clinical Practice. 1 ed. Switzerland: Springer International Publishing; 204 p.
13. Marcuse LV, Fields MC, Yoo JJ. 2015. Rowan's Primer of EEG E-Book: Elsevier Health Sciences..
14. Zaer NH, Jabbar BH, Muslim AT, Hasan ZN.2017. Drug Resistant Epilepsy Among Patients Attended The Neurosciences Hospital. Al-Kindy College Medical Journal. 13(1):10.15-8
15. Chowdhury RN, Hasan ATMH, Rahman KM, Mondol BA, Deb SR, Mohammad QD. 2013. Interictal EEG changes in patients with seizure disorder: experience in Bangladesh. SpringerPlus. 2:27.
16. Janszky J, Hoppe M, Clemens Z, Janszky I, Gyimesi C, Schulz R ,et al. 2005. Spike frequency is dependent on epilepsy duration and seizure frequency in temporal lobe epilepsy. Epileptic disorders. 7(4):355-9.
17. Kareem A-T. 2010. Etiologies of Adult Onset Epilepsy: Clinical and Paraclinical Study in the Governorate of Babylon. Iraqi Academic Scientific Journal. (4)9; -555: .61
18. Adel AK ,Tawfeeq FRALA 2011 lRisk factors and Neurological Disability Associated with Epilepsy in Iraqi Children . IRAQI JOURNALOF COMMUNITY MEDICINE. 24(2):31-128.
19. Qassim Hadi A-A, Ala Khalil A-B. 2006. The significance of EEG recording in confirming the diagnosis of epilepsy in cases referred for the 1st time. Mustansiriya Medical Journal. 6(1): .85-77:
20. Hisham Maddah A-A. 201. Epilepsy in Children: Unusual Presentations .IRAQI JOURNALOF COMMUNITY MEDICINE. 7(1) 29 45:
21. Babtain FA. 2013. Impact of a family history of epilepsy on the diagnosis of epilepsy in southern Saudi Arabia. Seizure-European Journal of Epilepsy. 22 (7): 542-7.
22. Najafi MR, Najafi MA, Safaei A. 2016. Association of Family History of Epilepsy with Earlier Age Onset of Juvenile Myoclonic Epilepsy. Iranian Journal of Child Neurology. 10 (2):10-5.
23. Seneviratne U, Cook MJ, D'Souza WJ. 2017. Electroencephalography in the Diagnosis of Genetic Generalized epilepsy Syndromes. Frontiers in neurology. 8: 499.
24. Baldin E, Hauser WA, Buchhalter JR, Hesdorffer DC, Ottman R. 2017. Utility of EEG Activation Procedures in Epilepsy: A Population-Based Study. Journal of clinical neurophysiology: official publication of the American Electroencephalographic Society. 34 (6):512-9.
25. Chowdhury AH, Chowdhury RN, Khan SU, Ghose SK, Wazib A, Alam I, et al. 2015. Sensitivity and Specificity of Electroencephalography (EEG) Among Patients Referred to an Electrophysiology Lab in Bangladesh. Journal of Dhaka Medical College. 23(2):215-22.
26. Lagunju IOA, Oyinlade AO, Atalabi OM, Ogbole G, Tedimola O, Famosaya A, et al. 2015. Electroencephalography as a tool for evidence-based diagnosis and improved outcomes in children with epilepsy in a resource-poor setting. Pan African Medical Journal. 22:(1)
27. Hamdy NA, Alamgir MJ, Mohammad EGE, Khedr MH, Fazili S. 2014. Profile of Epilepsy in a Regional Hospital in Al Qassim, Saudi Arabia. International Journal of Health Sciences. 8(3):247-55.
28. Kariuki SM, White S, Chengo E, Wagner RG, Ae-Ngibise KA, Kakooza-Mwesige A, et al. 2016. Electroencephalographic features of convulsive epilepsy in Africa: A multicentre study of prevalence, pattern and associated factors. Clinical Neurophysiology. 127(2):1099-107.