Original Article

Frequency of Interictal Epileptiform Discharges in Patients with New Onset Epilepsy

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ABSTRACT

Objective: The rational of this study to determine the frequency of inter-ictal epileptiform discharges and its various forms in new onset epileptic patients.

Study Design: Descriptive / cross sectional study.

Place and Duration of Study: This study was conducted at the Department of Neurology, Lady Reading Hospital Peshawar from 14 January 2021 to 14 June 2021.

Materials and Methods: In this research one hundred and seventy-seven patients participated, after taking detailed history, examination and routine investigations were carried out, Electro-encephalogram (EEG) was performed in all participants, CT scan Brain or MRI brain with or without contrast, lumbar puncture and other specific investigations were performed to exclude causes of provoked seizure. The EEG machine manufactured by: BIO-LOGIC, model**:** Ceegraph EEG System was used in this study to record abnormal electrical activity.

Results: In this study mean age was 35 years ± 13.28. Sixty four percent patients were male while 36% patients were female. Interictal epileptiform discharges was found in 66% in which 41% were sharp's, 23% spikes, 15% spike and wave activity, 11% polyspikes and polyspike and slow waves discharges in 10%.

Conclusion: Our study concludes that the frequency of interictal epileptiform discharges was 66% in patients with new onset epilepsy Interictal epilepticform discharges.

Key Words: EEG (Electro-encephalogram), Interictal epilepsy, Epilecticticform discharges

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INTRODUCTION

The International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE) have proposed a definition for epilepsy that describes it as a brain disorder characterized by an enduring propensity to cause epileptic seizures as well as the neurobiological, cognitive, psychological, and social consequences of this condition[1]. At least 2 unprovoked seizures must occur in a span of 24 hours for epilepsy to be diagnosed[1,2]. When a patient experiences one unprovoked seizure alongside an inter-ictal discharge, some doctors are additionally diagnosing epilepsy[1].

The median incidence of epilepsy was 51 per one million per year, however it was 42.0 for developed countries and 82.0 for low to middle-income countries[3]. In Pakistan the prevalence of epilepsy is estimated to be 10 per thousand population[4].

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Studies carried out in various settings have reported misdiagnosis rates of between 5% and 29%[5,6,7]. The most crucial component of the diagnostic evaluation is an accurate and thorough explanation of what happened from a witness, although this may not be possible. When an adult presents with an apparent unprovoked first seizure, electro-encephalography (EEG) should be taken into consideration as part of the routine neuro-diagnostic assessment (Level B). It can support the epilepsy diagnosis and help to categories the underlying epileptic illness[8,9]. Epilepsy is frequently linked with various EEG abnormalities. Epileptiform and non-epileptiform EEG abnormalities are categorized. Inter-ictal epileptiform discharges (IEDs), periodic lateralized epileptiform discharges (PLEDs), and generalized periodic epileptiform discharges (GPEDs) are a few types of epileptiform activity[10,11]. In PLEDs and GPEDs, acute symptomatic seizures can happen in 88% and 40% percent of cases, respectively, but there is little correlation between them and epilepsy[12,13]. Inter-ictal epileptiform discharges (IEDs) have twenty to fifty percent sensitivity and 98 to 99 percent specificity in adults and in children (96-97%) for epilepsy. There are many types of IED and in one of study in children these were found to be, fifty-three percent sharp, 13-14% spike, spike and slow wave in 6-8%, polyspikes in 13% and 21% have variable electrical discharges.[2] EEGs were reported as abnormal in 13 percent to 72 percent (average yield 54 percent) and as considerably abnormal in 6 percent to 49 percent

(average 30 percent) of the one Class I and ten Class II publications assessed (with a total of 1,756 patients) 12-25 examining the yield of EEG[14]. A regular EEG for people who had their first seizure revealed epileptiform abnormalities (IEDs) in about twenty-three percentage of patients, and they were indicative of seizure recurrence. Inter-ictal abnormal electric discharges (IEDs) were discovered in 42% of the youngsters in a research. The justification for the current study is that, as previously mentioned, data on the frequency of abnormal EEG activity in the form of (IEDs) varies widely. Most prior studies determined this frequency after a single unprovoked seizure, but we will do so after two unprovoked seizures that are separated by 24 hours, which will be more specific for epilepsy. In the majority of earlier investigations, the ratio of various IED was not provided.

In order to test the diagnostic value of this investigation in epilepsy and to aid us in the future diagnosis of this condition, which is a challenging and significant disease to diagnose, we will count the number of patients who have inter-ictal epileptiform discharges (IEDs) and the proportion of its various types in patients with new onset epilepsy. The findings of this study assist the neurologist in interpreting the EEG of a patient with newly developed epilepsy by letting them know what type of IED discharges to look for most frequently and least frequently.

MATERIALS AND METHODS

This is a cross sectional study conducted at department of Neurology, Lady Reading hospital Peshawar, duration of study was six months from 14 January 2021 to 14 June 2021. Sample size was 177, using 8%[2], proportion of spike- wave among patients with interictal epileptiform discharges, 95% confidence interval and 4% margin of error under WHO sample size calculations. Sampling technique was consecutive (Non Probability) sampling

Inclusion Criteria: All the patients with unprovoked generalized seizures, patients with 18-60 years, either gender.

Exclusion Criteria: In Children: parasomnias, breath-holding spells, vasovagal syncope, benign paroxysmal vertigo, staring spells, tic disorders and stereotypies, by history and examination. In young adults: Narcolepsy, periodic limb movements of sleep, sleep starts, paroxysmal dyskinesia, tic disorders, hemifacial spasm, stiff person syndrome, migraine, psychogenic non-epileptic pseudoseizures by history and examination. In older Adults: Cardiogenic syncope by ECG, Echo and if required holter monitoring. Transient ischemic attack, drop attacks, transient global amnesia by history, CT scan or MRI brain. Rapid eye movements sleep disorder by history. Past history of epilepsy. For provoked seizure Non contrast CT brain or MRI brain with and without gadolinium contrast to exclude structural pathology like, head injury, stroke, CNS infections (neurocysticercosis, tuberculoma, encephalitis, abscess, neurosurgical intervention). Lumber puncture to exclude CNS infection. Liver, renal function test, serum electrolytes, calcium and glucose, and toxic screen to exclude metabolic and toxic causes. These all conditions act as confounders and would introduce bias in the results if included in study.

Data Collection Procedure: Approval was sought from hospital ethical committee. All patients meeting the inclusion criteria were included in the study throughout patient department (OPD) and emergency and were admitted if required in the neurology ward for further evaluation. The diagnosis of epilepsy was based on criteria mentioned in operational definition. The inclusion and exclusion criterion was strictly followed to control confounder bias in study results. The purpose and benefits and risks of the study were explained to all patients' relatives and they were assured that the study was done purely for data publication and research purpose, and if agreed upon an informed written consent was obtained from all patients. After taking detailed history, examination and routine investigations were carried out, Electro-encephalogram (EEG) was performed in all participants, CT scan Brain or MRI brain with or without contrast, lumbar puncture and other specific investigations were performed to exclude causes of provoked seizure. The EEG machine manufactured by: BIO-LOGIC, model: Ceegraph EEG System was used in this study to record abnormal electrical activity, 25 to 30 minutes EEG was recorded digitally with a standard protocols and to increase its yield activation methods were used like hyperventilation, photic stimulation, after sleep deprivation and during sleep. The EEG was interpreted by expert fellow Neurology and neuro-electro-physiologist. Data was being recorded in a Proforma, as attached.

Data Analysis: SPSS version 10 was used to store and analyze all of the data. For numerical variables like age, mean and standard deviation were determined using descriptive statistics. For categorical variables like sex, inter-ictal epileptiform discharges, and its variants, frequencies and percentages were determined (spikes, sharp waves, spike & slow wave discharges, polyspike and polyspike & slow wave complexes). Age, sex, and time of onset were used to stratify IED and its many kinds in order to observe changes. The chi square test was applied in which P value ≤ 0.05 was considered as significant value. All results were presented in the form of tables.

RESULTS

Table No. 1: Interictal epileptiform discharges (n=177)

IED	Frequency	Percentage
Yes	117	66%
No	60	34%
Total	177	100%

In this study age distribution among one hundred seventy-seven patients was analyzed as 108 (61%)

patients were in age range 18-35 years, 62(35%) patients were in age range 36-50 years, 7(4%) patients were in age range 51-60 years. Mean age was 35 years ± 13.28, Male patients were 113(64%), while 64(36%) patients were female. Time of presentation was analyzed as 164(93%) patients presented within 24-48 hours, 9(5%) patients within 48-72 hours, and 4 (2%) patients presented within 72-1 week. Mean time of presentation was 24 hours ± 2.13. Inter-ictal epileptiform discharges was found in one hundred and seventy-seven (66%) and no abnormal electrical activity recorded in 60(34%) of patients (Table 1). Type of IED was analyzed as the sharp waves were present in 48(41%), spikes in 27(23%), spike & wave in 17(15%), Polyspike in 13(11%), and Polyspike & slow wave discharges in 12(10%) of patients (Table 2).

The Inter-ictal epileptiform activity and its variants were also stratified among age, gender and time of presentation to see the effect modifications as shown in (Table 3-5).

Table No. 2: Types of Interictal Epileptiform Discharges (n=117)

Variants of IED	Frequency	Percentage
Sharp's	48	41%
Single spike	27	23%
Spike & wave	17	15%
Polyspike activity	13	11%
Polyspike & slow wave discharges	12	10%

Table No. 3: Stratification of Types of Interictal Epileptiform Discharges W.R.T Age Distribution (n=177)

Types of IED		18-35 years	36-50 years	51-60 years	Total	* P value
Sharp activity	Yes	29	17	2	48	0.9929
	No	79	45	5	129	
Total		108	62	7	177	
Intermittent Spike	Yes	16	9	2	27	0.6057
	No	92	53	5	150	
Total		108	62	7	177	
Spike & wave	Yes	10	6	1	17	0.9085
	No	98	56	6	160	
total		108	62	7	177	
Poly-spike	Yes	8	4	1	13	0.7524
	No	100	58	6	164	
Total		108	62	7	177	
Poly-spike & slow wave discharges	Yes	7	4	1	12	0.7226
	No	101	58	6	165	
Total		108	62	7	177	

***Chi Square test was applied in which P value**

Table No. 4: Stratification of Types of Interictal Epileptiform Discharges w.r.t Sex Distribution (n=177)

Subtypes of IED		Male	Female	Total	* P value
Sharp activity	Yes	31	17	48	0.9003
	No	82	47	129	
Total		113	64	177	
Spike's	Yes	17	10	27	0.9177
	No	96	54	150	
Total		113	64	177	
Spike & wave	Yes	10	7	17	0.6505
	No	103	57	160	
total		113	64	177	
Poly-spike discharges	Yes	8	5	13	0.8574
	No	105	59	164	
Total		113	64	177	
Poly-spike & slow wave complex	Yes	8	4	12	0.8329
	No	105	60	165	
Total		113	64	177	

***Chi Square test was applied in which P value**

Table No. 5: Stratification of Types Of Interictal Epileptiform Discharges W.R.T Time Of Presentation (n=177)

Multiple Variants of IED		24-48 hrs	48-72 hrs	72hr-1wk	Total	* P value
Sharp activity	Yes	45	2	1	48	0.9386
	No	119	7	3	129	
Total		164	9	4	177	
Spike's	Yes	25	1	1	27	0.8133
	No	139	8	3	150	
Total		164	9	4	177	

Spike & wave	Yes	15	1	1	17	0.5612
	No	149	8	3	160	
total		164	9	4	177	
Poly-spike discharges	Yes	12	1	0	13	0.7769
	No	152	8	4	164	
Total		164	9	4	177	
Poly-spike & slow wave complex	Yes	11	1	0	12	0.7560
	No	153	8	4	165	
Total		164	9	4	177	

*Chi Square test was applied in which P value

DISCUSSION

The morbidity and fatality rates associated with epilepsy are high. Better quality of life for these people is a result of early diagnosis and rapid treatment. In our study, there were one hundred and seventy-seven patients, 64% of whom were men and 36% were women. In 66 percent of patients, IED were aberrant, while in the remaining 34%, EEG results were normal. According to a cross-sectional study by Chowdhury-RN et al. at the electrophysiology laboratory of the Dhaka hospital, which had 767 patients, the overall sensitivity of EEG in detecting aberrant IED was 62.7 percent[15]. Inter-ictal epileptiform activity on the EEG was present in 52% of the first record, in eighty five percent by the third record, and in 93 percent by the fourth in another international study that examined data from 1,202 EEGs on 428 adult patients, the majority of whom had definite epilepsy that first manifested in adulthood. Beyond this limit, serial EEG output is rather low[16]. The sensitivity of a single EEG has been reported in one research by Edward B. Bromfield to be in the range of 52%, however estimates have fluctuated from as low as 9% to as high as 76 percent[17]. Similarly, EEGs taken for newly developing seizures in a research by Wirrell et al. revealed epileptiform discharge in roughly 17 to 54 percent of children and 14 to 52 percent of adults. In individuals whose conventional EEG findings were normal, an EEG performed after sleep deprivation increases detection of epileptiform abnormalities and reveals discharge in 12 percent to 33 percent of cases[18]. According to the AAN meta-analysis, EEGs were reported as abnormal in 13 percent to 72 percent of the one Class I and ten Class II articles reviewed (with a total of 1,756 patients), with an average yield of 51 percent, and as significantly abnormal in 6 percent to 49 percent of the cases. IEDs were discovered in 66 percent of the study participants, which is alarmingly high. This was accomplished through patient selection, as opposed to the previous research where EEG was performed after a single unprovoked seizure, we chose individuals for whom EEG was performed after two unprovoked seizures, increasing the possibility that IEDs would be discovered in our patients. In our study the intermittent sharp activity was present in (41%) spike's in (23%), spike & wave in (15%), Poly-spike discharges in (11%), and Poly-spike and slow wave discharges in (10%). This is supported by a study conducted in Taif, Kingdom of Saudi Arabia, in this study (IEDs) were found in 62% among abnormal EEGs. Among IEDs there are various sub types and they occur in the following frequency, sharp activity in 52%, spikes in 14-15%, and spike & wave in 6%, polyspike in 13% and polymorphic waves 21%. In another study conducted in Brazil by Raquel Rego et al. included thirteen to sixteen years (mean of 6.5 years and median 4.0 years), 405 were female (59%). Sharp activity found in 78 cases (42%), spike in 22 (11%), polispikes in 15 (7.8%), spike-wave in 18 (10%), polispike-wave in 22 (12%) and variable discharges in 33 (17.5%)[19]. In our theses, among the patients with IEDs in their EEG records, 67.7% appeared between 24–48 hours, 5 (55.6%) within 48–72 hours, and 1 (25.0%) within 72–1 week. Since clinical seizures are temporally linked to more frequent IEDs, early presentation following a seizure increases the likelihood that IEDs will be evident in the EEG record. A study that found an elevated incidence of IED when an EEG study was conducted within two days or within seven days of a recent seizure supported our findings[20]. In a different study by King et al., epileptiform anomalies were found in 52% of patients in whom EEGs were taken within 24 to 48 hours of their first seizure, as opposed to just 35% of those who's EEGs were taken later[21]. In a different case series, an early EEG within 48 hours appeared to produce epileptiform abnormalities in a manner comparable to a later sleep-deprived study[22]. According to the findings, young people with newly diagnosed epilepsy are more likely than the elderly group to have an abnormal EEG. Our research findings indicated a younger age at the time of EEG, a longer duration of epilepsy, and an earlier age at epilepsy beginning were all associated with the occurrence of IEDs in people with epilepsy[23].

CONCLUSION

Our study concludes that the frequency of inter-ictal epileptiform discharges was 66% in patients with new onset epilepsy and epileptiform discharges were more common in young and middle age patients with new-onset epilepsy. IED aids physicians in predicting the onset of a future epileptic syndrome, as well as the type, location, and intensity of seizures.

Author's Contribution:

Concept & Design of Study:	Asad Ullah Khan
Drafting:	Muhammad Zaheer
Data Analysis:	Mehtab Alam, Samar Iltaf
Revisiting Critically:	Asad Ullah Khan,

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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