

## Study of EEG Findings in Patients Referred from Psychiatrists

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### Summary:

*EEG is not so commonly used in patients attending psychiatry department. It is predominantly required to rule out any organic cause behind the behavioral changes. Purpose of this study was to assess the referred cases from psychiatry department and determine the clinical factors associated with an abnormal EEG in patients with psychiatric problem. We retrospectively reviewed and analyzed the data of all the cases referred to EEG lab. of Dept. of Neurology, Dhaka Medical College Hospital from psychiatrist. A total of 50 patients from July 2009 to January 2011 were selected. From the EEG register following information were noted eg. age, sex, socioeconomic status, habitat, rural or urban, clinical features, associated features, probable clinical diagnosis and EEG findings. The results showed that most of the patients belonged to age group 11-20years, comprising 46 % (n-23),*

*66% (n-33) were female. Though the total rate of abnormal EEG in psychiatry patients are low (n-20). 44% of the patients having seizure as the presenting complaint had the largest number of EEG abnormality (n-16), p value <.001. Patients with primary psychiatric disorders did not have any epileptiform activity (n-22). Where as most of the patients (n-27) who were undiagnosed at the time of referral had the largest number of EEG abnormality (n-19), p value <.002. So any patient presenting to psychiatry department with seizure disorder or any patient with diagnostic confusion should be evaluated with EEG.*

**Key words:** Generalized epilepsy (GE), Localization related epilepsy (LRE), psychogenic nonepileptic seizures (PNES).

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### Introduction:

Electroencephalography (EEG) is the recording of electrical activity along the scalp produced by the firing of neurons within the brain. In clinical contexts, EEG refers to the recording of the brain's spontaneous electrical activity over a short period of time, usually 20–40 minutes, as recorded from multiple electrodes placed on the scalp. In neurology, the main diagnostic application of EEG is in the case of epilepsy, as epileptic activity can create clear abnormalities on a standard EEG study. A secondary clinical use of EEG is in the diagnosis of coma, encephalopathy, and brain death.<sup>1</sup>

The electroencephalogram is believed to be of limited value in psychiatry. This is particularly true for patients with neurosis and functional psychosis. With the advent of modern imaging like CT scan or MRI, EEG has got limited value in organic states like tumors, stroke and other focal brain disorders, although former gives a structural and later gives functional assessment of cerebral function. EEG is the investigation of choice in suspected cases of epilepsy and can differentiate between seizure and pseudo seizure. There is well documented relationship between psychosis and epilepsy. In particular temporal lobe abnormalities may present with mental illness.<sup>2</sup> Gruhle, Hill and Pond found psychotic states in epileptic patients that closely resembled schizophrenia. In their review they found

lesions in temporal lobe in most of the patients. Slater studied 69 epileptic patients presenting with a schizophreniform psychosis; 80% had temporal lobe epilepsy (TLE).<sup>3,4,5</sup>

There are doubts and arguments about the role of EEG in psychiatry. Although psychiatrists send patients for EEG where there is doubt about seizure, pseudo seizure and psychosis. With this background the aim of this study is to correlate various clinical presentations of psychiatric patients to EEG findings and to guide clinicians in cases where EEG is indicated to differentiate between a primary psychiatric disorder and epilepsy.

### Materials & methods:

This is a retrospective observational study carried out in EEG lab of Department of Neurology of DMCH from July 2009 to January 2011. All the patients referred from Department of Psychiatry or psychiatrists for EEG were enrolled for the study. Information of non co-operative patients or EEG with marked artifact were discarded. Data of first 50 patients were taken from EEG register. From the EEG register following information were noted eg. age, sex, socioeconomic status, habitat, rural or urban, clinical features, associated features, probable clinical diagnosis, EEG findings and diagnosis. EEG was done in international 10/20 system using surface electrodes. After proper recording EEG were analyzed and reported by two Neurologist of Department of Neurology of DMCH. EEG showing focal epileptiform activity was labeled as LRE (Localization Related Epilepsy) and generalized epileptic activity was labeled as GE (Generalized Epilepsy). Data were recorded and analyzed using SPSS system.

### Results:

The number of cases referred from the department of Psychiatry to Neurology for EEG evaluation is sparse. We just had 50 cases from the psychiatry department. We carried out a retrospective observation of patients from hospital records. The results of observation are quite interesting. Most of the patients belong to age group 11-20years, comprising 44 % (n-22) and 62% of patients was below 20years of age. 66% of the

patients were female (Table-I). 34% patients experienced sudden onset of symptoms whereas 66% had gradual onset of illness. Symptom analysis revealed that seizure (true or pseudo seizure) was present in 22 patients (44%) (Table-II). At the time of referral 54% of the patients did not have any specific diagnosis on underlying psychiatric disorder (Table-III). Analysis showed a strongly positive association between seizure event at presentation and likelihood of getting an abnormal EEG diagnosis, p value 0.0001 (Table-IV). During referral 46% patient had specific diagnosis of underlying psychiatric disorder. But only 1 patient had a LRE diagnosed. Rest of the patients (n-27) who were undiagnosed had the highest number of EEG positive cases (Table-V).

**Table I**

#### *Socio demographic profile of the patients*

Parameter		n	%
Age	<10 yr	9	18
	11-20 yr	22	44
	21-30 yr	9	18
	31-40 yr	7	14
	41-60 yr	2	4
	>60 yrs	1	2
Sex	Male	17	34
	Female	33	66
Habitat	Rural	32	64
	Urban	18	36
Socioeconomic status	Lower class	22	44
	Middle class	25	50
	Higher class	3	6

Table I: Most of the patients belong to age group 11-20years, comprising 44 % (n-22) and 62% of patients was below 20years of age. 66% of the patients were female. Majority of them were from rural areas (64%) and belonged to middle class (50%).

**Table II**

<i>Clinical symptoms and associated features</i>			
Parameter		n	%
Onset	Sudden	17	34
	Gradual	33	66
Duration	Years	21	42
	Months	18	36
	Weeks	6	12
	Days	2	4
Symptoms	Seizure	22	44
	Unconsciousness	22	44
	Altered behavior	21	42
	Headache	13	26
	Burning head	7	14
	Psychosis	7	14
	Others	8	16
Associated features			
	Family History	5	10
	Birth injury	3	6
	Cerebral palsy	5	10
	H/O encephalitis	3	6
	Substance abuse	4	8
	Family dispute	5	10
	Mental retardation	4	8
	Decreased school performance	7	14
Drug History			
	Antidepressant	12	24
	Anti epileptic	10	20
	Antipsychotic	7	14
	No drugs	21	42

Table II: 34% patients experienced sudden onset of symptoms whereas 66% had gradual onset of illness.

Symptom analysis revealed that seizure (true or pseudo seizure) was present in 22 patients (44%), unconsciousness in 22 patients and altered behavior in 21 patients. history of cerebral palsy was found in 10% and Birth asphyxia in 6%. Many of them received antidepressant (24%) and antiepileptic (20%) drugs.

**Table III**

<i>Underlying psychiatric disorder and EEG</i>			
Parameter		n	%
Underlying psychiatric disorder			
	Conversion disorder	6	12
	Somatoform disorder	3	6
	Depression	6	12
	Schizophrenia	7	14
	Others	1	2
	Undiagnosed	27	54
EEG Diagnosis	Normal	30	60
	LRE	14	28
	GE	6	12
EEG Findings	Normal	30	60
	Spike and wave	14	28
	Sharp and wave	4	8
	Focal slow wave	2	4
Site of epileptiform activities			
	Temporal lobe	8	16
	Frontal lobe	2	4
	Paracentral	3	6
	Hemispheric	1	2
	Generalized	6	12

Table III: At the time of referral 54% of the patients did not have any specific diagnosis on underlying psychiatric disorder. Conversion disorder was present in 6 cases, Somatoform disorder in 3, depression in 6 and schizophrenia in 7 cases. EEG was normal in 60% cases, LRE in 28%, GE in 12%. Most common EEG abnormality was in the form of Spike and wave in 28%, most common location was Temporal lobe (16%).

**Table IV**

<i>Seizure and EEG diagnosis</i>					
Seizure	Normal	LRE	GE	Total	
Present	Count	5	12	5	22
	% within seizure	22	54	22	100
	% within EEG Diagnosis	16	85	83	44
	% of total	10	24	10	44
Absent	Count	25	2	1	28
	% within seizure	89	7	2	100
	% within EEG Diagnosis	83	14	16	56
	% of total	50	4	2	56
Total	Count	30	14	6	50
	% within seizure	60	28	12	100
	% within EEG Diagnosis	100	100	100	100
	% of total	60	28	12	100
Chi-Square test		df			<i>p</i>
	Pearsons Chi-Square	2	0.0001		
	Likelihood ratio	2	0.0001		

**Table V**

<i>Underlying psychiatric disorder and EEG diagnosis</i>					
Underlying Psychiatric disease		N	LRE	GE	Total
Conversion Disorder	Count	6	0	0	6
	% within EEG Diagnosis	20	0	0	12
	% of total	12	0	0	12
Somatoform Disorder	Count	3	0	0	3
	% within EEG Diagnosis	10	0	0	6
	% of total	6	0	0	6
Depression	Count	6	0	0	6
	% within EEG Diagnosis	20	0	0	12
	% of total	12	0	0	12
Schizophrenia	Count	7	0	0	7
	% within EEG Diagnosis	23	0	0	14
	% of total	14	0	0	14
Others	Count	0	1	0	1
	% within EEG Diagnosis	0	7	0	2
	% of total	2	0	0	2
Undiagnosed	Count	8	13	6	27
	% within EEG Diagnosis	27	93	100	54
	% of total	16	26	12	54
Total	Count	30	14	6	50
	% of total	60	28	12	100
Chi-Square test		df			<i>p</i>
	Pearsons Chi-Square	10		.002	
	Likelihood ratio	10		.000	

Table IV: Analysis showed a strongly positive association between seizure event at presentation and likelihood of getting an abnormal EEG diagnosis, p value 0.0001

Table V: During referral 46% patient had specific diagnosis of underlying psychiatric disorder. But only 1 patient had a LRE diagnosed. Rest of the patients (n-27) who were undiagnosed had the highest number of EEG positive cases. The association of underlying psychiatric disorder and positive EEG diagnosis is highly significant, p value <.002.

### Discussion:

The value of EEG in psychiatry is an issue of debate since the advent of these electrophysiological studies in the 1930. Interestingly there are few credible studies in this area in home and abroad, and much of the earlier studies had poor research design and hence unwarranted conclusions.

Among the cases in our study, 66% (n-33) were female and 34% (n-17) were male. Here female outnumbers male. Most of the patients belong to age group 11-20years, comprising 44 % (n-22) and 62% of patients was below 20years of age. Next was the age range from 0-10, having 9 patients. Only one patient was above 60 years. In this study 64% (n-32) of the patients were from urban areas and 36% (n-18) from rural area. 44% (n-22) of patients belonged to lower social class and only 6% belongs to higher class. Onset of illness was gradual in 66% of the patients. 42% patients suffered for years together while 12% waited for weeks before getting their EEG done. Here it is evident that patients with combined psychiatric neurologic symptoms suffer for long time before getting consultation from specialists. Analysis of symptoms revealed that seizure (true or pseudoseizure) was present in 44% (n- 22) patients, in 44% (n-22) patients there was history of unconsciousness, 21 patients had history of altered behavior, headache in 13 patients and psychotic features were present in 4 patients. Psychogenic nonepileptic seizure (PNES) or pseudoseizures are common at epilepsy centers, where they are seen in 20-30% of patients referred for refractory seizures. PNES are probably also common in the general population, with an estimated prevalence of 2-33 cases per 100,000 populations. Misdiagnosis of epilepsy is common. Misdiagnosis occurs in approximately 25% of patients with a previous diagnosis of epilepsy that does not respond to drugs. Most cases

of misdiagnosed epilepsy are eventually shown to be psychogenic nonepileptic seizures (PNES) or, more rarely, syncope.<sup>6,7,8</sup> 44% (n-17) of the patients with abnormal EEG findings had seizure at onset of illness. Analysis revealed a strong association between seizure and EEG abnormality, p value .0001 (Table-IV). So any patient with seizure that visits psychiatry department should be evaluated with EEG for further management. Out of 50 patients 10% (n-5) patients had cerebral palsy, 8% (n- 4) patients had mental retardation, there was presence of birth injury in 3 patients, and 5 patients had history of family dispute. Bruck showed the overall prevalence of epilepsy was 62% in cerebral palsy. Incidence of epilepsy was predominant in patients with hemiplegics and tetraplegic palsies: 70.6% and 66.1%, respectively.<sup>9,10,11</sup> The cumulative risk of seizures and epilepsy was investigated in a prospectively identified cohort of 221 children with mental retardation (MR) born between 1951 and 1955 in Aberdeen, Scotland. By age 22 years, 33 (15%) had epilepsy.<sup>9</sup> At the time of referral for 24% (n-12) were on antidepressant, 20% on antiepileptic, 14% were on antipsychotic drugs where as 42% were without these drugs. Probable psychiatric diagnosis was Dissociative disorder in 6 patients, Somatoform disorder in 3 patients, Depression in 6 patients, Schizophrenia in 7 patients and diagnosis was not mentioned in 27 patients. 1 patient thought to be of psychiatric disorder actually had LRE (Table- III) Analysis shows that 50% of the conversion disorder patients had seizure at onset, while 63% of the patients who did not have a definite diagnosis of psychiatric illness had seizure at presentation. Co morbidities of epilepsy and psychiatric disorder is common, yet the most common are depression, nervousness, anxiety, PNES, and less common being Schizophrenia and psychosis.<sup>10-14</sup>

EEG revealed that 60% (n-30) had normal findings, 28% (n-14) had Localization related epilepsy (LRE), and 12% (n-6) had Generalized epilepsy (GE). 54% of the patients who were undiagnosed at the time of referral, had the most number of EEG abnormality. Analysis showed a strong association between underlying psychiatric disorder and EEG negativity, p value .002 (table-V). This signifies the role of EEG in any patient of psychiatry with diagnostic confusion. Out of 16 patients of LRE 8 originated from Temporal lobe and rest from Frontal, Parietal lobes and Central and Para central areas. All the patients suspected of Dissociative disorder had normal

findings in EEG. Interestingly enough, most of the patients among the undiagnosed subgroup at the time of referral had positive EEG findings 54% (Table-V). In 14 patients, abnormal EEG was in the form of spike & wave, and in 4 patients sharp & wave.

### Conclusion:

EEG is not routinely advised in patients suspected of primary psychiatric disorder. Whereas it has important role in classification and management of seizure disorders. Patients with epilepsy often have got psychiatric symptoms and co morbidities specially in temporal lobe epilepsy eg. complex partial seizure. On the other hand in patients with PNES symptoms, EEG might be helpful in differentiating from true seizure. So judicious use of EEG might be helpful in management of patients with psychiatric and neurological symptoms.

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