
Clinical, metabolic, radiological and electroencephalographic abnormalities in patients with seizure disorder –A Hospital Based Study in Kashmir Valley

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Abstract:

Objective: *To study the clinical, metabolic, radiological and electroencephalographic abnormalities in patients with seizure disorder.*

Methods: *We analyzed 206 patients with seizures in whom a thorough clinical history and physical examination was done. Metabolic parameters, CT head, EEG, were done in all patients and MRI in selected patients. CSF analysis was done in selected cases.*

Results: *Overall loss of consciousness (66.5%) was the most common clinical finding. Post Ictal confusion was present in 136*

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patients (66.0%). Metabolic abnormalities significant enough to contribute to seizures were present in 24 patients (11.6%).CT Head was abnormal in 39.8% patients and MRI Brain in 54.4% patients. EEG was normal in 110 patients (53.3%) and abnormal in 96 patients (46.7%).

Key words: Seizure disorder, loss of consciousness, CT in seizure disorder.

INTRODUCTION

A seizure or convulsion is a paroxysmal, time limited change in motor activity and/or behaviour that results from abnormal electrical activity in the brain. Epilepsy is a condition in which seizures are triggered recurrently from within the brain. A seizure (from the Latin “sacire”- to take possession of) is a paroxysmal event due to abnormal, excessive, hyper synchronous discharge from aggregate of central nervous system (CNS) neurons. Depending on the distribution of the discharge, this abnormal CNS activity can have various manifestations ranging from dramatic convulsive activity to electrical phenomena not readily discernible by an observer. Overall lifetime risk of one seizure is 8-10% (Forgersen L et al, 1996).

Essential Diagnostic procedures in patients with first seizure (B. Eden et al, 2006):

- Clinical examination.
- Assessment of seizure semiology.
- Routine laboratory tests depending on clinical circumstances.
- Cerebrospinal fluid examination (if encephalitis or subarachnoid hemorrhage is suspected).
- Drug screening depending on clinical circumstances.

- Early standard EEG if possible within 24 hours.
- Sleep deprived EEG within one week.
- High resolution MRI if possible.

Electroencephalography: Richard Caton (1842-1926) was a physician practicing in Liverpool. He used a galvanometer and found that feeble currents of varying direction pass through the multiplier when the electrodes are placed on two points on the external surface of skull, or if one electrode is placed on the gray matter and another on the surface of skull. This sentence is regarded to indicate the birth of electrophysiogram. Pravdich – Neminsky recorded the EEG from brain, dura or intact skull of a dog. He described a 12-14 /sec rhythm under normal condition and it's marked slowing under asphyxia. Furthermore, he coined the term electrocerebrogram. The development of clinical and experimental EEG works reached a high point around 1960, after 30 years of steady progress. The interest of electroencephalographics in academic institutions tended to shift from tracing with all its waves and patterns to automatic data analysis (E.Niedermeier, 1998).

An analysis from a number of studies concluded that an EEG performed after the first epileptic seizure yielded information that was insufficient to affect treatment recommendations (Gilbert DL et al, 2000). But those argue that an EEG is an appropriate investigation following the first unprovoked epileptic seizure do so for a number of reasons (Gilliam F et al, 1988, Holmes GL, 1996). Firstly, a previously unrecognized seizure syndrome may be recognized. Secondly the determination of recurrence risk may be enabled by EEG and appropriate counselling can be given to patients.

All patients whose seizures are precipitated by exercise, triggered by excitement or occur during sleep should have an ECG recorded, or at the very least, a rhythm strip performed, to look for evidence of cardiac conduction abnormalities. Though

the cardiac syncope are rare, it is well recognized that these are misdiagnosed as epilepsy and the mortality rates for untreated individuals are very high (Paria SV et al 1994, Gattoo EM et al 1996).

In a situation of genuine clinical doubt and when episodes occur in increasing frequency, long term EEG and video-monitoring should be considered. This allows correlation of ictal video and EEG data and in the majority of situations will allow a confident diagnosis to be made (Thompson JL et al, 1999).

An EEG performed after the initial seizure also helps to predict recurrence, particularly if there is an epileptiform abnormality. Electroencephalography continues to be the most important diagnostic tool in the management of patients with epilepsy. In particular, the high specificity of interictal epileptiform discharges makes scalp EEG a valuable tool in the evaluation of patients with a history of seizure or seizure like episodes (Anil Mendiratta, 2003).

IMAGING MODALITIES:

Computed Tomography: The introduction of computed tomography (CT) brain scanning in the early 1970s ushered a new era of non invasive techniques for imaging the brain. With his new tool clinicians could for the first time generate pictures of brain parenchyma showing structural abnormalities in soft tissues of brain, surface of brain and the ventricles (Dennis B. Smith 1990).

Almost thirty percent of the seizure disorders show structural abnormalities on CT scanning. These include generalized atrophy, focal atrophy, hydrocephalus, calcifying lesions and porencephaly in that order. This large proportion of abnormalities has prompted some practitioners to advice CT scan as routine investigation in patients with epilepsy (Scolla

lavizani et al, 1997). In studies by Bachman (1976), highest incidence of abnormalities was found in partial seizures (43%) as compared to generalized seizures (32%).

The extent to which CT has changed the etiological profile of epilepsy can be gauged by the fact that 26% of patients presumed to be normal on angiography were found to have lesions on CT scanning (Francis O et al, 1983). The yield of abnormalities on CT, when the neurological examination and EEG were normal, was 5-10%. Abnormalities on neuroimaging were associated with a higher seizure recurrence risk. Focal lesions on CT scan tend to be more commonly found in adults (18-24%) than in children (0-12%). But at least studies provide evidence that the MRI scanning is preferable to CT in children following non febrile seizures (D. Hirtz et al 2000).

The ILAE guidelines for neuroimaging studies suggest that a CT can be the diagnostic imaging of choice in patients with epilepsy if an MRI is not available. This recommendation should be weighed against the fact that studies have shown that CT may fail to detect abnormalities in up to 50% of patients with epileptogenic structural lesions such as small tumors and vascular malformations. The ILAE also recommends that patients who have intractable seizures have an MRI study done if a CT is normal. Presently, MRI is considered the imaging procedure of choice in the patients with epilepsy (RI. Kuzenieniecky, 2005).

MRI Brain: The sensitivity of MRI in detecting abnormalities in patients with epilepsy is in part associated with the pathology of the underlying epilepsy and in part with the MRI techniques and experience of the interpreting physician. Developmental malformations constitute the most common underlying pathology in infants and young children with epilepsy. MRI epilepsy protocols have been established in many centers with the intention of improving sensitivity and

specificity. Major group of pathologies in which MRI has made enormous contributions to epilepsy is the malformations of cortical development (MCDs). MCDs are common among children and should be sought in children with epilepsy. All patients with symptomatic generalized or focal seizures should have a structural neuroimaging study. Because MRI is far better than CT in the detection of structural lesions, it is suggested that MRI should be the imaging procedure of choice when evaluating patients with seizures, especially if focal seizures are present on neurological examination or EEG. In addition, MRI is indicated if seizures persist in the presence of a previously normal CT scan or when there are progressive neurologic changes. A repeat MRI is also indicated at 2-5 years in the context of a previously normal MRI in a patient with persistent seizures (RI. Kuzenieniecky, 2005).

This study is one of the few in the Kashmir valley done to see the clinical, metabolic and radiological abnormalities in patients admitted to tertiary care hospital in the valley.

AIMS AND OBJECTIVES:

To study the clinical, metabolic radiological and electroencephalographic abnormalities in patients with seizure disorder.

MATERIALS AND METHODS:

This prospective study was carried out in the post graduate department of Medicine of S.M.H.S hospital of Government Medical College, Srinagar. All patients with seizures attending medical OPD and In-patient department were included in the study irrespective of their age and sex.

All patients underwent:

1. Detailed history.

2. Detailed clinical examination with emphasis on neurological and cardiovascular system.
3. Electrocardiogram.
4. EEG during interictal period and video EEG (where ever necessary).
5. Serum electrolytes- sodium, potassium, calcium, magnesium (wherever necessary).

Other investigations where ever necessary:

1. CT head (plain/contrast).
2. MRI Brain (1.5 Tesla) - Epilepsy protocol.

Statistical analysis: Data was described as mean \pm standard deviation and percentage. Inter group variance was measured at 95% confidence interval. Metric data was compared by students t test whereas non metric data was compared by MannWhitney U test and chi square test. Data analysis was performed with the help of statistical package for social sciences (SPSS) and Microsoft excel.

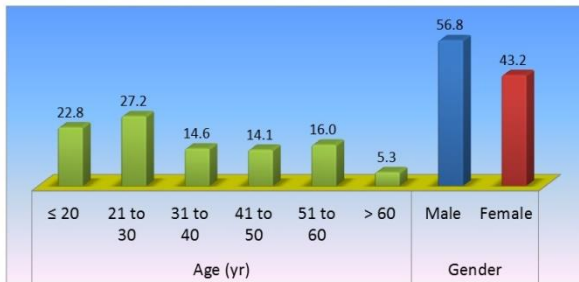
OBSERVATION AND RESULTS:

Study sample comprised of 206 patients with seizures of which 117 (56.7%) were males and 89 (43.3%) were females. The mean age was 32.3 years with a standard deviation of 15.1 years. The minimum and maximum age of the patient was 16 years and 84 years respectively. There was statistically no significant difference as per age distribution in our study (p value=0.703).

Age and Gender distribution of the Seizure Patients							
Age (yr)	Male		Female		Total		p value
	N	%	n	%	n	%	
≤ 20	32	27.4	15	16.9	47	22.8	0.703 (NS)
21 to 30	22	18.8	34	38.2	56	27.2	
31 to 40	20	17.1	10	11.2	30	14.6	

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41 to 50	18	15.4	11	12.4	29	14.1
51 to 60	18	15.4	15	16.9	33	16.0
> 60	7	6.0	4	4.5	11	5.3
Total	117	56.8	89	43.2	206	100.0
mean ± SD	35.6 ± 15.2 (16,84)		34.8 ± 15.0 (16,69)		32.3 ± 15.1 (16,84)	



Out of 206 patients, 97 patients (47%) had partial seizures, 66 patients (32%) had generalized seizures and 43 patients (21%) had undetermined seizures. Simple partial seizures were present in 20 patients (9.7%), complex partial seizures in 53 patients (25.7%) and partial seizures with secondary generalization were present in 24 patients (11.7%).

Tonic seizures were present in 12 patients (5.8%), clonic seizures in 10 patients (4.9%), tonic clonic seizures in 32 patients (15.5%), myoclonic, absence and astatic seizures were present in 6, 5 and 1 patient respectively.

Type of Seizure			
		n	%
Partial seizure (n=97)	Simple Partial Seizure	20	9.7
	Complex Partial Seizure	53	25.7
	Partial Seizure with Secondary Generalization	24	11.7
Generalized seizure (n=66)	Tonic Seizure	12	5.8
	Clonic Seizure	10	4.9
	Tonic Clonic Seizure	32	15.5
	Myoclonic Seizure	6	2.9
	Absence Seizure	5	2.4
	Astatic Seizure	1	0.5
Undetermined (n=43)	Undetermined	43	20.9

Clinical variables: 11 clinical variables in history were analyzed. Loss of consciousness, post Ictal confusion and urinary/fecal incontinence were the most common clinical manifestations and were present in 137 patients (66.5%), 136 patients (66.0%) and 90 patients (43.7%) of the patients respectively. Frothing was present in 78 patients (37.9%), tongue bite in 71 patients (34.5%), headache and vomiting in 50 patients (24.3%) and 30 patients (14.6%) respectively. Other clinical features included weakness of any side, fever and trauma.

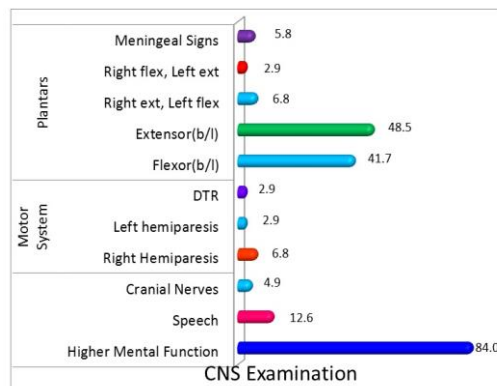
History of present illness		
	n	%
Loss of Consciousness	137	66.5
Post Ictal Confusion	136	66.0
Urine/Fecal Incontinence	90	43.7
Frothing	78	37.9
Tongue bite	71	34.5
Headache	50	24.3
Vomiting	30	14.6
Weakness of any side	25	12.1
Fever	12	5.8
Trauma	7	3.4
Drugs/Toxins	5	2.4

Thorough CNS examination was done in all patients. Higher mental functions were abnormal in 84% of patients on admission. 10 patients had cranial nerve palsy while 14 patients had right hemiparesis and 6 patients had left hemiparesis. Plantar response was flexor in 41.7% patients and extensor in 48.5% patients on admission and meningeal signs were present in 12 patients.

CNS Examination			
		n	%
Higher Mental Function	Normal	33	16.0
	Abnormal	173	84.0
Speech	Normal	180	87.4
	Abnormal	26	12.6
Cranial Nerves	Normal	196	95.1

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	Abnormal	10	4.9
Motor System	Normal	186	90.3
	Right Hemiparesis	14	6.8
	Left hemiparesis	6	2.9
DTR	Present	200	97.1
	Absent	6	2.9
Plantars	Flexor(b/l)	86	41.7
	Extensor(b/l)	100	48.5
	Right ext, Left flex	14	6.8
	Right flex, Left ext	6	2.9
Meningeal Signs	Present	12	5.8
	Absent	194	94.2



Metabolic abnormalities: They were studied in all patients was studied and found that hyponatremia was present in 9 patients (4.4%), hypocalcemia was present in 5 patients (2.4%), hypoglycemia in 8 patients (3.9%), hyperglycemia in 3 patients and hypomagnesemia in 2 patients.

Metabolic parameters			
		n	%
Sodium	Hyponatremia	9	4.4
	Normal	197	95.6
	mean \pm SD	138.5 \pm 5.0 (109,148)	
Calcium	Hypocalcemia	5	2.4
	Normal	201	97.6
	mean \pm SD	9.2 \pm 0.7 (6,10)	
Magnesium	Hypomagnesemia	2	1.0
	Normal	204	99.0
	mean \pm SD	2.0 \pm 0.4(1,5)	

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BloodGlucose (R)	Hypoglycemia	8	3.9
	Normal	195	94.7
	Hyperglycemia	3	1.5
	mean ± SD	99.5 ± 28.6 (22,236)	

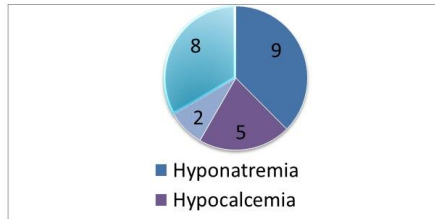
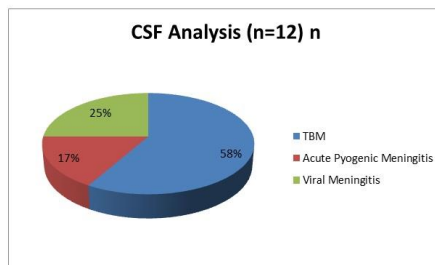


Diagram showing metabolic abnormalities in studied patients.

CSF analysis was done in 12 patients only. CSF picture suggestive of tubercular meningitis was seen in 7 patients, that of viral encephalitis was seen in 3 patients and that of acute pyogenic meningitis was seen in 2 patients only.

CSF Analysis (n=12)		
	n	%
TBM	7	58.3
Acute Pyogenic Meningitis	2	16.7
Viral Meningitis	3	25.0

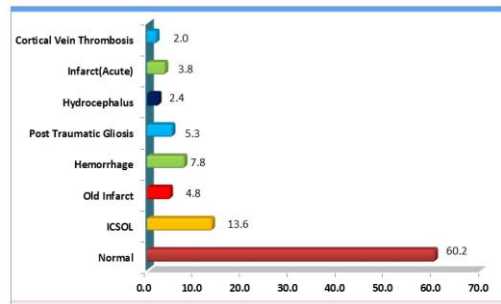


CT head: CT was done in all 206 patients. It was normal in 124 patients (60.2%). It showed ICSOL in 28 patients (13.6%), hemorrhage in 16 patients (7.8%), old infarct in 10 patients (4.8%), posttraumatic gliosis in 11 patients (5.3%),

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hydrocephalus in 5 patients (2.5%). Other findings were acute infarct and cortical vein thrombosis.

CT Head		
	n	%
Normal	124	60.2
ICSOL	28	13.6
Old Infarct	10	4.8
Hemorrhage	16	7.8
Post Traumatic Gliosis	11	5.3
Hydrocephalus	5	2.4
Infarct(Acute)	8	3.8
Cortical Vein Thrombosis	4	2.0



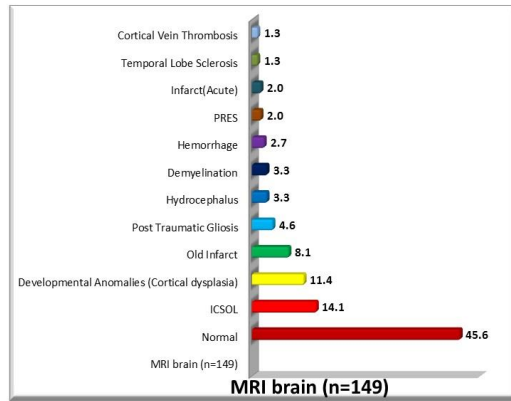
Graph showing findings of CT head in patients.

MRI brain: MRI was done in 149 patients, out of which it was normal in 68 patients (45.6%). Findings were ICSOL in 21 patients (14.1%), infarcts in 15 patients (10.1%), cortical dysplasia in 17 patients (11.4%), post traumatic gliosis in 7 patients (4.6%). Other findings were temporal lobe sclerosis, hemorrhage, demyelination, PRES, cortical vein thrombosis and hydrocephalus.

MRI brain (N=149)		
	n	%
Not Needed	57	27.7
Normal	68	45.6
ICSOL	21	14.1
Infarct(Acute)	3	2.0
Old Infarct	12	8.1
Post Traumatic Gliosis	7	4.6

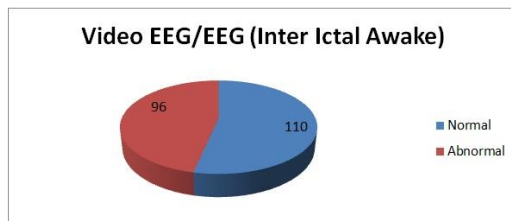
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Temporal Lobe Sclerosis	2	1.3
Cortical dysplasia	17	11.4
Hemorrhage	4	2.7
PRES	3	2.0
Demyelination	5	3.3
Cortical Vein Thrombosis	2	1.3
Hydrocephalus	5	3.3



EEG: EEG was done in all 206 patients. It was normal in 110 patients (53.3%) and abnormal in 96 patients (46.7%).

Video EEG/EEG (Inter Ictal Awake)		
	n	%
Normal	110	53.3
Abnormal	96	46.7



DISCUSSION

The present study is one of the few studies to describe the clinical, metabolic, radiological and electroencephalographic abnormalities in patients with seizure disorder. This prospective study was conducted on patients attending the Post Graduate department of General medicine, Government medical college Srinagar. A total of 206 patients were taken in the study. A detailed history and thorough general physical and systemic examination was done in all patients. CT head, EEG, metabolic profile, ECG was done in all patients and MRI brain in selected patients. The following observations were noted from the study.

Age and Gender: In this study the mean age was 32.3 ± 15.1 years. Out of 206 patients males were 117 (56.8%) and females were 89 (43.2%). The difference was not statistically significant. Similar results were observed by Maromi Nei et al, 2004 in his study in which the mean age was 34 years with 58% males and 42% females. Maeike Zijlmans et al, 2002 studied 104 patients and in his study the mean age was 34 years.

Type of Seizure: Out of 206 patients, partial seizures were present in 47.1% patients, 32% had generalized seizures and undetermined seizures in 20.9%. Similar findings were observed by King et al, 1998 who observed 25% of cases with generalized seizures.

Symptomatology: We analyzed 11 clinical variables in patients. Overall loss of consciousness was the most common clinical finding and was found in 137 patients (66.5%). Post Ictal confusion was present in 136 patients (66.0%). Other findings were urine/faecal incontinence which was present in 90 patients (43.7%), frothing in 78 patients (37.9%), tongue bite in

71 patients (34.5%), headache in 50 patients (24.3%). Other clinical features were vomiting, Todd's palsy, fever and trauma. These clinical features have been described in standard text books on Epilepsy.

Metabolic Abnormalities: Metabolic evaluation was done in all 206 patients included in this study. Metabolic abnormalities significant enough to contribute to seizures were present in 24 patients (11.6%). 9 patients had hyponatremia (4.4%), 8 patients had hypoglycemia (3.9%), 5 patients had hypocalcemia (2.4%) and 2 patients had hypomagnesaemia (1.0%). Similar findings were observed by Bromfield EB, 1997.

CT Head and MRI Brain: CT Head was done in all 206 patients included in this study. It was normal in 124 patients (60.2%). Abnormalities include ICSOL in 28 patients (13.6%), infarcts in 18 patients (8.7%), hemorrhage including cortical bleed and subarachnoid hemorrhage in 16 patients (7.8%), post traumatic gliosis in 11 patients (5.3%), hydrocephalus and cortical vein thrombosis in 2.4% and 2% patients respectively.

MRI brain was done in 149 patients, out of which it was normal in 68 patients (45.6%). Findings were ICSOL in 21 patients (14.1%), infarcts in 15 patients (10.1%), cortical dysplasia in 17 patients (11.4%), Post traumatic gliosis in 7 patients (4.6%). Other findings were temporal lobe sclerosis, hemorrhage, demyelination, PRES, cortical vein thrombosis and hydrocephalus.

CT Head was abnormal in 39.8% patients and MRI Brain in 54.4% patients. Neuroimaging (CT/MRI) is a useful tool to determine the etiological diagnosis of seizure with the literature showing a prevalence of CT abnormalities between 34-45% (Bernal B, 2003).

Sempre AP et al, 1992 found that patients who were older than 45 years had a greater likelihood of neuro imaging

abnormalities, related to stroke (37.9%) and neoplasm (12%). William H et al, 1986 conducted a comparative study of CT, MRI and PET in 36 patients of whom 17 had localized epileptic discharge and other 19 had a non localized epileptic discharge. Of the former 12 patients underwent MRI of which 11 (91.6%) were abnormal while in the later 9 (64.2%) were abnormal. Henemann PL et al, 1994 conducted a retrospective study on 333 patients with new onset seizures and found abnormalities in 41% patients undergoing cranial CT. Bachman D et al, 1976 reported CT abnormality in 43% patients with partial seizures and in 32% cases of generalized seizures.

EEG: We did EEG (inter ictal awake) in all patients and video EEG in selected patients and found that EEG was normal in 110 patients (53.3%) and abnormal in 96 patients (46.7%). The findings of our study were consistent with results of Hopkins et al, 1988 who found EEG abnormal in 40.8% patients and King MA et al, 1998 who reported abnormal EEG in 44% of patients with partial seizure and 65% of patients with generalized seizure.

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