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Original Article

Internal Medicine Section

Clinicoradiological Evaluation of Newly Diagnosed Epilepsy: A Monocentric Prospective Study from a Tertiary Care Hospital of Eastern India

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ABSTRACT

Introduction: Newly Diagnosed Epilepsy (NDE) is defined as a subset of epileptic disorders, which is presented or diagnosed first time during study period and had two or more than two episodes of seizure. Early evaluation and diagnosis of epilepsy is very important for better treatment.

Aim: To evaluate epidemiological, clinical profile as well as radiologic characteristics in cases of NDE and to find out correlation between them.

Materials and Methods: It was a prospective and descriptive study of three year duration conducted in the Department of Neurology in SCB Medical College and Hospital, Cuttack, Odisha, India. A total of 300 NDE patients more than five years of age were included and subjected to detailed clinical and radiological evaluation.

Results: Majority patients in our study were from second and third decade (mean age 25 years, SD=11.04) with characteristic male preponderance. Most patients were from rural background and majority of them (60%) had attended Neurology clinic after three to 10 episodes of seizures. Seizures in awake state and seizures without precipitating factors were more common. Headache was the most common prodromal symptom. Generalised seizure dominated over focal seizure (62:34) with tonic-clonic type (66.67%) being most common in the generalised seizure cohort. Focal seizure with secondary generalisation was seen in 70.5% cases. Drowsiness (38%) and Todd's Palsy (6%) were most and least common postictal symptoms in our study. Our study also revealed abnormal Computed Tomography (CT) findings in 70.6% of focal seizures and 24.2% of generalised seizures. MRI, though done in 250 patients only, 53.6% were abnormal. Granulomatous lesion was dominant neuroimaging finding in our study.

Conclusion: This study concluded that males of second and third decade from rural background are highly prone to epilepsy. Infectious causes like Neurocysticercosis (NCC) and tuberculoma are predominant aetiologies in our area. Neuroimaging plays an important role in establishing and localising aetiology of seizure. Any patient coming with history of epilepsy must be investigated with neuroimaging for further management.

Keywords: Neurocysticercosis, Neuroimaging, Tuberculoma

INTRODUCTION

Epilepsy is a common neurological condition. The term is coined from the ancient Greek word "epilepsia" meaning something seizing. Epilepsy was defined conceptually (2005) as a disorder of brain characterised by an enduring predisposition to generate epileptic seizures [1]. Practically, the term applied as having two unprovoked seizures >24 hours apart. The ILAE (International League Against Epilepsy) accepted the recommendations of the task force (2014) and proposed that epilepsy to be considered as, a disease of brain defined by any of the following conditions:

1) At least two unprovoked (or reflex) seizures occurring >24 hours apart.
2) One unprovoked seizure (or reflex) and probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures occurring over next 10 years.
3) Diagnosis of epilepsy syndrome [1].

Thurman DJ et al., describes New Onset Epilepsy (NOE) cases as those cases of epilepsy where numerator includes people identified at their second unprovoked seizure [2]. In contrast, the numerator for NDE include both new onset epilepsy and people with greater than two unprovoked seizures who are first time diagnosed with epilepsy during the study period [2]. Seventy million people have epilepsy with the incidence of 45-76 of newly diagnosed cases per 100000 worldwide [3]. Overall, prevalence of epilepsy in India was found to be 5.3% with slightly higher incidence in rural areas (5.5%) [4]. In India, incidence of epilepsy is estimated to be 49.3/100000, leading to about half a million cases every year [5]. ILAE classified epilepsy as generalised epilepsy, focal epilepsy with or without awareness (dyscognitive features) or unknown type [6]. Presentation of various types of epilepsy varies as regards to their risk factors, seizure frequency, semiology, aetiology, neuroradiological and electroencephalographic features.

Therefore, the aim of this study was to analyse the clinical profile, neuroimaging characteristics in all the cases of NDE included in the study group and to find out correlation between clinical features and neuroimaging characteristics.

MATERIALS AND METHODS

It was a prospective and descriptive study conducted at a tertiary care hospital (S.C.B Medical College and Hospital, Cuttack) of Odisha, India, during period August 2013 to August 2016. Total 300 NDE patients were included in the study group. Ethical clearance was obtained from the Institutional Ethical Committee of SCB Medical College, Cuttack, Odisha, India.

Inclusion Criteria

a) NDE cases more than five years age.
b) Eligible subjects should meet clinical criteria for an epileptic seizure (ILAE-2014).

Exclusion Criteria

a) Patients with seizures on treatment or head injuries.

b) Patients with systemic illness, metabolic abnormalities or seizure provoked by external factors like alcohol withdrawal.

c) Eclampsia with seizure.

Methodology

Patients were subjected to detailed epidemiological as well as clinical evaluation and were recorded in a predesigned proforma. Family history of epilepsy was defined as presence of epilepsy in first degree relatives (i.e., parents, siblings and children). Thorough routine investigations as well as metabolic parameters like Blood Urea Nitrogen (BUN), Fasting Blood Sugar (FBS), Liver Function Test (LFT), Serum Calcium, Serum Phosphate, chest X-ray, CT scan/MRI Brain including all sequences (plain and contrast) and interictal Electroencephalography (EEG) (ictal and sleep deprivation EEG when required) were done for all patients.

STATISTICAL ANALYSIS

All the statistical analysis were done by SPSS software version 24.0 p-value was considered significant when <0.05.

RESULTS

Our study revealed that 222 (74%) males and 78 (26%) females were affected. The number of patients from rural 186 (62%) were more affected than urban 114 (38%). Majority of patients were from second and third decades with declined trend after third decade [Table/Fig-1].

Age (Years)	No. of Cases	Percentage (%)	
5-10	12	4	Mean=25 year SD=11.07.
11-20	90	30	
21-30	126	42	
31-40	42	14	
41-50	18	6	
50 and more	12	4	

[Table/Fig-1]: Age at onset of seizure.

Majority of patients developed seizure during awake state 180 (60%) than during sleep 48 (16%) or both 72 (24%). A positive family history of seizure was obtained in 18 patients (6%). Distributions of number of seizures at time of presentation were shown in [Table/Fig-2] which showed majority 130 (60%) had three to 10 episodes.

No. of Seizures	No.	Percentage (%)
2	90	30
3–10	180	60
11–20	30	10
>20	0	-
Total	**300**	**100**

[Table/Fig-2]: Number of seizures at presentation.

No precipitating factors were found in majority patients 174 (58%), however sleep deprivation, emotional strain, missing medication, fatigue, missing meal, flicker flash, were present in 66 (22%), 18 (6%), 18 (6%),12 (4%), 6 (2%), 6 (2%) cases respectively. Headache was the most common prodromal symptom as shown in [Table/Fig-3].

Using ILAE classification generalised seizures and focal seizures were found in198 patients (66%) and 102 (34%) respectively. Our study showed 18 patients (6%) had both true and pseudoseizure [Table/Fig-4].

Out of 198 patients of generalised seizures group, majority 132 (66.67%) patients had tonic-clonic seizures as shown in [Table/Fig-4]. On analysing clinical features of generalised seizure uncosciousness,

Prodromal Symptoms	No.	Percentage (%)
No symptoms	228	76
Headache	24	8
Giddiness	18	6
Irritability	6	2
Restlessness	12	4
Anxiety	6	2
Polyphagia	-	-
Dreamy State	6	2
Total	**300**	**100**

[Table/Fig-3]: Prodromal symptoms.

Clinical Seizure type	No.	Percentage (%)
Tonic–clonic	132	66.67
Tonic	12	6.06
Clonic	6	3.03
Atonic	12	6.06
Myoclonic	6	3.03
Absence	12	6.06
Atypical absence	6	3.03
Myoclonic+GTCS	12	6.06
Total	**198**	**100**

[Table/Fig–4]: Types of generalised seizure.
GTCS-Generalised tonic-clonic seizure

cyanosis, tonic-clonic movement, frothing, tongue bite, sphincteric disturbance, injury during seizure, clenching of teeth, uprolling of eyeball, flushing were present in 198 (100%), 6 (3%), 168 (84.8%), 156 (78%), 72 (36%), 60 (30%), 24 (12%), 132 (66.6%), 144 (72.7%), 12 (6%) respectively. Most patients had three to five above symptoms during generalised seizure. Drowsiness was most common postictal symptom 118 (38%) followed by no symptom 96 (32%), confusion 36 (12%), headache 36 (12%) and Todd's palsy 18 (6%), found in our study. Focal seizure with secondary generalisation was found in majority cases of focal seizure 72 (70.5%) as shown in [Table/Fig-5].

Types of partial seizures	No.	Percentage (%)
Focal seizure with retained consciousness (simple partial seizures)	12	11.8
Focal seizure with impaired consciousness (complex partial seizures)	18	17.7
Focal seizures with secondary generalisation	72	70.5
Total	**102**	**100**

[Table/Fig-5]: Types of focal seizure.

On analysing symptomatology of 18 cases focal seizure with impaired consciousness, staring, automatism, epigastric discomfort were present in equal proportion of six cases each (33%). All 300 patients subjected to CT brain and abnormalities were found in 120 patients (40%). Abnormal CT findings among 120 patients (100%) were ring/disc lesion 42 (35%), calcification 24 (20%), brain atrophy 12 (10%), tumour 12 (10%). Gliosis, infaction, porencephaly, Mesial Temporal Sclerosis (MTS), enlarged cisterna magna each contribute six (5%) of total cases.

CT brain was found abnormal in 48 patients (24.2%) of generalised seizure and 70 patients (70.6%) of focal seizure [Table/Fig-6]. Ring/disc enhancing lesion and calcification were present mainly in focal seizure [Table/Fig-6]. The [Table/Fig-7] shows maximum CT abnormality in patients having seizure frequency one to five per month.

Out of 250 patients subjected for MRI studies 134 patients (53.6%) showed MRI abnormalities and MRI findings were given below [Table/Fig-8].

Results of CT scan		Generalised seizures		Focal seizures		Total	
		No.	Per-centage (%)	No.	Per-centage (%)	No.	Per-centage (%)
Total		198	100%	102	100%	300	100%
Normal		150	75.8%	30	29.4%	180	60%
Ring/disc lesions		12	6.1%	30	29.8%	42	14%
Gliosis		-	-	6	5.8%	6	2%
Calcification		6	3.1%	18	17.2%	24	8%
Atrophy		12	6.1%	-	-	12	4%
Vascular	Haemorrhage	-	-	-	-	-	-
	Infarction	6	3.1%	-	-	6	2%
Tumour		-	-	12	11.6%	12	4%
Porencephaly		6	3.1%	-	-	6	2%
Mesial temporal sclerosis		-	-	6	5.8%	6	2%
Cisterna magna		6	3.1%	-	-	6	2%

[Table/Fig-6]: Shows comparison of CT brain finding with seizure pattern.

CT scan abnormality		Frequency per month		
		<1	1-5	>5
Ring/disc		12	24	
Gliosis		-	-	6
Calcification		12	12	6
Atrophy		6	6	-
Vascular	Haemorrhage	-	-	-
	Infarction		6	-
Tumour		-	6	6
Porencephaly/congenital lesion		-	6	-
Mesial temporal sclerosis		-	6	-
Cisterna magna		6		-

[Table/Fig-7]: CT scan abnormalities vs seizure frequency.

S No.	MRI abnormality in newly diagnosed epilepsy	No. of cases (%)
1.	Granulomatous lesion	77 (30.8%)
	NCC (Neurocysticercosis)	49 (19.6%)
	Tuberculoma	23 (9.2%)
	Others	5 (2.1%)
2.	Focal gliotic/encephalomalacia changes	8 (3.2%)
3.	Tumour	11 (4.4%)
4.	Atrophy	2 (0.8%)
5.	Congenital/Developmental anomaly (cortical dysplasia, leukodystrophy etc.)	5 (2%)
6.	Mesial temporal sclerosis	6 (2.4%)
7.	Cortical vinous sinus thrombosis	1 (0.4%)
8.	Calcification	21 (8.4%)
9.	Miscellaneous	3
	Hydrocephalus	1 (0.4%)
	Small vessel ischaemic change	1 (0.4%)
	Vascular malformation	1 (0.4%)
	Total	250 (100%)

[Table/Fig-8]: MRI abnormalities.

DISCUSSION

Males were more affected than females in our study. Similar higher male predominance observations are made by several workers [6-9]. Study conducted in India by Bharucha NE et al., reported that more number of males getting affected by epilepsy in which prevalence of males (5.1 per 100) were significantly higher than females (2.2 per 100) [8], whereas Senanayake N did not shown any difference between two sexes [10]. The reason of males outnumbering females in our study may be because of social structure of our country, where females are widely neglected. The literature review reveals that rural population is at higher risks than urban people for epilepsy [9,11], similar trend was observed in our study. Bangalore Urban Rural Neuro-Epidemiological Study (BURNS) has revealed high prevalence rate of epilepsy in rural communities (11.9/1000) being twice that of urban [12]. Study by Sridharan R showed no statistically significant difference in prevalence between male–female or urban–rural dwellers [13], indicating divergent trends in different populations. Peak age of onset of epilepsy in our study was second and third decades with declining trend after third decade and this was similar to study by Verma SR et al., whereas, western study by Kotsopolous I et al., observed age specific annual incidence of unprovoked seizure and epilepsy increased with age and is maximum at or after 65 years of age [14,7]. Decline in incidence rates after third decade in our study, could be due to lesser life expectancy of epilepsy patients. Gibberd FB and Bateson MC found nocturnal attacks only in 38 out of 645 cases where in our case nocturnal attacks were present in only 48 patients (16%). Our study coincides with the previous study [15].

The familial aggregation of seizure disorders has been recorded. The clustering of disease among family members may be because of shared genetic and/or exposure to shared environmental factors [9]. Our study revealed positive family history of epilepsy in 18 patients (6%), which is almost similar to study by Bharucha NE et al., (3.8%) but Babtain FA in his study of 420 patients showed positive family history in 27% with younger age of onset seizure (15–20 years) [8,16]. This may be due to small population size in our study or prevailing superstition and taboo about epilepsy in society. Majority of cases attend our clinic with three to 10 episodes of seizure which reflects prevalent taboos about the disease in the society, lower socioeconomic background and low-level of literacy, which stops patients from coming for treatment. Sleep deprivation, Mental or emotional strain, fatigue, missing medication, missing meal, flicker flash were present in decreasing order in our study though majority of epileptics are unable to perceive any triggering factor. Emotional stress precipitates seizure in 31.3% persons with epilepsy and people with epilepsy have 2-14% chance of having seizures precipitated by light or pattern [17,18].

The profile of epilepsy varies across various cultures. A review by Fisher RS et al., has shown slight higher prevalence of partial seizure (51.1%) over generalised seizure (43.9%) [1]. A study by Pal Surender Kumar et al., has shown generalised seizures (67.5%) were more common in idiopathic epilepsy patients which supports our study, where generalised seizures (66%) were more frequent than focal seizure (34%) [9]. Sridharan R et al., have concluded equal prevalence of both generalised and partial seizure before 40 years, whereas partial seizure rises to 75% by 75 years [13]. Among generalised seizures tonic-clonic type was seen in majority cases with lowest incidence of clonic, myoclonic, atypical absence. Our data on GTCS is high, due to higher percentage of generalised seizures. On analysis of clinical profile it is seen focal seizure with secondary generalisation was most common (70.5%) focal seizure. A study by Verma SR et al., has

described proportion of complex partial seizure, simple partial seizure, partial seizure with secondary generalisation in proportion of 11.2%, 10%, 8.7% respectively [14]. This dissimilarity may be due to poor sample size and wrong presentation by patients. Approximately 20% of persons referred to comprehensive epilepsy centers were found to have non-epileptic seizures on video EEG monitoring and in our study both true and pseudo seizure was present in (6%) only [19]. Hence, any epilepsy patient with antiepileptic drug failure or atypical presentation should be evaluated for pseudo seizures.

CT scan is a useful tool to determine aetiologic diagnosis of seizure and was abnormal in 120 patients (40%) in our study which is comparable to other Indian studies showing CT abnormalities ranging from 25-70% [20,21]. A study by Tchalla AE et al., on newly diagnosed epileptic seizures of elderly people describes abnormal CT brain in 71.5% [22]. Present study revealed more CT abnormalities in focal seizures 70 (70.6%) than generalised seizures 48 (24.2%). Previous Indian study by Baheti R, et al., has shown proportion of CT abnormality in generalised and partial seizure as 13 (50%), 9 (34.6%) respectively [23]. This variation in incidence of CT scan abnormalities may be due to influence of clinical presentation.

Wadia RS et al., studied 150 cases of focal seizures and observed ring or disc enhancement in 26% whereas, it is 35% in our series [24]. Ring/disc lesions not seen in western regions with so high incidence accept latin–american nations. Ring/disc lesions were major findings in focal epilepsy 30 (29.8%) though present in generalised epilepsy 12 (6.1%) and were predominantly found in second and third decades in present study. The focal calcification of unknown aetiology was observed in 18 (17.2%) cases of focal seizure in our series whereas it is reported as 3.3% by Wadia RS et al., and 11.5% by Baheti R et al., [24,23]. It concludes calcification is one of the common causes of focal seizure. Baheti R et al., have reported cerebral atrophy in six (23%) of generalised seizure and four (15.3%) of partial seizure whereas our study has shown atrophy in 12 (6.1%) generalised seizure only. Tumours were found in 12 (11.6%) patients of focal seizure and almost similar figures were found in a study by Wadia RS et al., 9.5% [24]. Unprovoked seizures after a clinically detected stroke were seen in 2.7-35% (Hauser WA et al.,) but in our study infarction accounts for six (3.1%) of generalises seizure [25]. Maximum CT abnormality was observed in patients having seizure frequency one to five per month.

According to Verma SR et al., studied 271 children in a teaching care hospital of Northen India and found MRI abnormality in 106 cases (39%), out of which granulomatous lesions, mesial temporal sclerosis, hydrocephalus, tumours, cerebral atrophy were present in 56 (33.3%), five (3%), four (2.4%), two (1.2%), two (1.2%) respectively whereas in our series MRI abnormality, granulomatous lesions, MTS were present in 134 (53.6%), 77 (30.8%), six (2.4%) respectively [14]. According to a study by Dhadke VN et al., on 100 cases of epilepsy over 13 year age found ring enhancing lesions in 15 patients (15% cases) out of which 10 patients had tuberculoma and five had NCC whereas, NCC 49 (19.6%) followed by tuberculoma, 23 (9.2%) were dominant findings in our study [26]. The high incidence of NCC can be explained by geographical variation and sanitary condition of our region.

CONCLUSION

This present study concluded that most epileptics were male, of rural community and second and third decade. Seizures during awake state were more frequent than nocturnal attacks. Familial aggregation of seizures though important, played a minor role in our study. Due to increase illiteracy of rural community majority patients sought medical advice with more than three episodes of seizure. Generalised seizure was most common type in our cohort. Granulomatous lesions (NCC and tuberculoma) were predominant aetiological neuroimaging findings. As infectious causes like NCC and tuberculoma are predominant aetiologies in our area, which are usually treatable conditions neuroimaging plays an important role in establishing and localising aetiology of seizure. Any patient coming with history of seizure or suspected as a case of newly diagnosed epilepsy must be investigated with neuroimaging for further management.

LIMITATION

This is only a small population study, we need larger population study with additional studies of epileptic populations across various cultures and geographical areas to allow broad generalisations and difference in magnitude.

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