Original Research Article

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Clinical, Electroencephalographic and Radiological Profile of Epilepsy in A Tertiary Care Hospital from Central India

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Abstract

Introduction: In India 10 million people are suffering from epilepsy. The etiology of epilepsy is complex and heterogeneous amongst various studies. The distribution of subtypes of epilepsy is variable in different parts of our country. There is dearth of data on epilepsy from central India.

Aims and Objective: To study subtypes of epilepsy and to findout nuro imaging and EEG abnormalities.

Material and Methods: This is an retrospective observational study of 122 patients of epilepsy done during a period of one year conducted in the department of Neurology. All patients underwent detailed clinical EEG and neuroimaging.

Results: Mean age of the patients was 26.31years. Male to female ratio was 2.29:1. Majority of patients belonged to the second to fourth decade of life. Total 71.31% patients had generalized seizures while 28.69% patients had partial seizures. Interictal EEG was abnormal in 37% patients. Neuroimaging abnormality was found in 42.62% patients. Neurocysticercosis was diagnosed in 9%, tuberculoma was found in 5% cases while a vascular cause was identified in 15.57% patients.

Conclusion: The young age males were more commonly affected & predominant seizure semiology was generalized tonic clonic and predominant epilepsy type was idiopathic generalized. The most common cause is vascular followed by granuloma. Majority of patients responded to monotherapy and compliance of drug intake is very good that might be due to good counselling policy of our department regarding need of continue management.

Keyword: Epilepsy Profile; Seizure Profile; Epilepsy Epidemiology; EEG in Epilepsy; Neuroimaging in Epilepsy.

Introduction

Epilepsy is a condition of chronic, recurring seizures and most disabling aspect is unpredictability of when and where the next seizure will occur. Its etiology is complex and heterogeneous. Its prevalence varies in relation to ethnicity, geography, age and sex. Seizure frequency, type and duration are other important characteristics of epilepsy in a population. These peculiarities are known to affect other neurological, behavioral and scholastic characteristics. *Epileptic seizure* is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in brain [8]. *Epilepsy* is a disorder of the brain characterized by an enduring predisposition to generate epileptic seizures and by the neurobiological, cognitive, psychological and social consequences of this condition [8].

The traditional definition of epilepsy requires at least two unprovoked seizures [8]. A practical clinical definition by ILAE 2014 included: (1) At least two unprovoked (or reflex) seizures occurring >24 h apart; (2) one unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures, occurring over the next 10 years; (3) diagnosis of an epilepsy syndrome [28]. About 50 million people world-wide suffering from epilepsy

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[1]. The prevalence of active epilepsy in developed countries ranges from 4-10 per 1000 population and in developing countries 6–10 per 1000 population [2,3,4,5]. In India its prevalence is 5.25 per 1000 population [6]. Incidence of epilepsies varies from 40-70 per 1000 person in developed countries and 100-190 /1000 person in developing countries [4].

Acute symptomatic seizures provoked by metabolic or toxic derangements or occurring acutely in the setting of head trauma or stroke do not define epilepsy. Classification of epilepsy is based on ILAE. *Epileptic syndrome* as "an epileptic disorder characterized by a cluster of signs and symptoms customarily occurring together; these include such items as type of seizure, etiology, anatomy, precipitating factors, age of onset, severity, chronicity, diurnal and circadian cycling, and sometimes prognosis." A syndrome does not necessarily have a common etiology and prognosis. Two important divisions were used in the classification. The first separated epilepsies with generalized-onset seizures, called *generalized epilepsies*, from epilepsies with partial-onset seizures, referred to as *localization-related*, *partial*, or *focal epilepsies*. The other division separated epilepsies of known etiology (named *symptomatic epilepsies*) from those of unknown etiology. Epilepsies of unknown etiology were named *idiopathic* if they were pure epilepsy and "not preceded or occasioned by another condition." These epilepsies were considered to have no underlying cause other than a possible hereditary predisposition. Thus, they were presumed genetic. The idiopathic epilepsies were also defined by an age-related onset and clinical and EEG characteristics. Epilepsies of unknown etiology were called *cryptogenic* if they were presumed symptomatic, but with an occult etiology [8]. According to ILAE 2001, scheme for describing seizures under 5 axis; axis 1 describes seizure semiology, axis 2 type of seizure, axis 3 syndromic diagnosis, axis 4 etiology and axis 5 functional impairment [9]. The etiology and risk factors for epilepsy varies with age and geographical area. Central nervous system infection, tumor and head trauma as cause for epilepsy can occur at any age however tumours are more likely over age of 40. Stroke as a risk factor for epilepsy is more common above 60 years of age. Endemic infections like tuberculosis and neurocysticercosis as etiology of epilepsy are more common in developing countries [7].

There is a lack of data from this part of the country addressing various types of epilepsy, epileptic syndromes and common etiologies for epilepsy. This is essential to plan treatment and counseling of epilepsy according to local data and individual characteristics. With this aim the present study was conducted at our tertiary care hospital attached to a medical college, catering largely to a rural population.

Aims & Objective

1. To study the types of epilepsy in this part of central India.
2. To find out EEG abnormalities in epilepsy patients.
3. To find out the radiological abnormalities in cases of epilepsy.

Material & Methods

1. Sample design: This is a retrospective observational study done in patients presenting with seizures to department of neurology, SAMC & PGI, Indore for one year duration to a single observer.
2. Sample size 122 patients.
3. Patients were classified according to ILAE 1989.
4. Surface EEG, awake and sleep record was obtained in all patients.
5. CT and/or MRI scan was done in all cases of seizures as required.
6. Demographic characteristics namely age, sex, vegetarian /non vegetarian, age at onset , duration of seizure, number of seizure in last one year, family history, and types of seizure and epilepsy were compared.
7. Data was collected on Excel sheet and analyzed with appropriate statistic test.

Inclusion

1. All patients with seizures presenting to neurology outdoor or indoor department of Neurology to a single observer.
2. The study is approved by institutional ethics committee.

Results

1. Total 122 patients of epilepsy were enrolled during the study period. There were 85 (70%) males and 37 (30%) females. Male to female ratio was 2.29:1.
2. Mean age was 26.31 years (SD13.49). Maximum number of patients 63 (51.63%) were in young age

group of 21 to 40 years (Table 1). In most patients (n=51, 41.80%) age at onset of seizure were found to be between 11-20 years (Table 2).

3. Family history of seizures was found in only 12 (9.83%) patients.
4. Total 87 (71.31%) patients had generalized seizures while 35 (28.68%) patients had partial seizures. The generalized tonic clonic type of seizures were found in maximum (n=66, 54.09%) number of patients followed by simple partial seizures (n=24, 19.7%) .
5. The different types of epilepsy found in our study were; Generalized idiopathic (n=62, 50.81%), generalized symptomatic (n=24, 19.67%), generalized cryptogenic (n=1, 0.8%), localization related idiopathic epilepsy (n=5, 4.09%), localization related symptomatic epilepsy (n=28, 22.95%) and localization related cryptogenic (n=2, 1.63%) (Table 3). Juvenile myoclonic epilepsy was found in 3 (2.45%) patients.
6. Baseline Interictal EEG record were abnormal in 45 (37%) and normal in 77 (63%) patients. Generalized epileptiform discharges were present in 27 (22.13%) and focal epileptiform discharges were present in 05 (4.09%) patients (Table 4).
7. Neuroimaging were abnormal in 52 (42.62%) patients and normal in 70 (57.37%) patients. MRI abnormalities were found in 50 patients and CT abnormalities were found in 02 patients.

Table 1: Different types of seizures

Types	Number	Percentage
Generalised tonic clonic	66	54.09%
Generalised atonic	2	1.63%
Generalised clonic	1	0.81%
Generalised tonic	8	5.73%
Absence	4	3.27%
Myoclonic	4	3.27%
Multiple types generalised seizures	2	1.63%
Simple partial	8	6.55%
Simple parttial with sec generalised	16	13.11%
Complex partial	4	3.27%
Complex partial with sec generalised	7	5.73%

Table 2: Distribution of age at onset of seizure

Age	Number	Percentage
0-10years	20	16.39%
11-20years	51	41.80%
21-30years	24	19.67%
31-40years	16	13.11%
More than 40years	10	8.19%

Table 3: Types of epilepsy in study group

Types	Number	Percentage
Generalised idiopathic	62	50.81%
Generalised symptomatic	24	19.67%
Generalised cryptogenic	1	0.81%
Localization related idiopathic	5	4.09%
Localization related symptomatic	28	22.95%
Localization related cryptogenic	2	1.63%

Table 4: Pattern of EEG abnormality in study population

EEG Pattern	Number	Percentage
Generalised epileptiform discharges	27	22.13%
Generalised slowing	4	3.27%
Focal epileptiform discharges	5	4.09%
Focal slowing	8	6.55%

8. Most common abnormality detected was vascular i.e. stroke [arterial or venous], found in 19 (15.57%) patients. Second most common cause was granulomatous lesion. Neurocysticercosis was found in 11(9.0%), tuberculoma was found in 6 (4.91%) patients and diagnosed on the basis of imaging criteria (Table 3).
9. The history of taking antiepileptic drugs was present in 41 (34%) patients before they come to us. The history of seizure episodes in last one year before starting treatment in our institute was 1-4 (SD=5.63) in recruited patients.
10. After recruitment of patients in our institute 86 (70.49%) patients were on single antiepileptic drug while 36 (29.51%) on two or more drugs. The most commonly prescribed drugs were sodium valproate (n=34, 27.86%) and phenytoin (n=26, 21.31%). Acute phenytoin toxicity were found in 6 (4.91%) and side effects like hair loss and drowsiness were found in two patients on sodium valproate. Drug compliance was very good in almost all patients. In follow up of one year seizure frequency of 1-2 (SD=3.04) episodes were found in 56 (46%) patients on drug which suggest almost 50% reduction in seizure frequency and no seizures were found in 45 (36.88%) patients.

Discussion

Clinical Profile;

In this study total 122 patients of epilepsy were included. The all patients were included in the study classified as per ILAE 1989 criteria for seizure and epilepsy classification. It is at present most accepted and globally used classification in various studies.

The mean age of presentation of epilepsy patients in our study was 26.39 (SD 13.49) years and maximum number of patients are in age group of 21-40 years. However, most common age of onset was in the range of 11-20 years and this was similar to previous studies from India (10-19 years) [15]. The mean age of onset in our study was 21.9 years, similar to study by Thomas et al in which the mean age of onset was 19.9 years [16]. In our study epilepsy was more common in males as compare to females (male to female ratio 2.29:1) and this observation also found in many studies from India [13,15]. The family history was positive in 12 (9.83%) of patients in our study, similar to previous studies [13, 15].

The profile of epilepsy varies across various cultures and the review shows that in western countries about two-third of the epileptic patients have partial seizures. Similar trend has been shown in some developing countries like Nigeria. Predominance of partial seizures (52.1%) over generalized seizures (47.11%) though of lesser magnitude has been reported from Peru. On the contrary, reverse trend has been reported in Indian studies, where generalized seizures constitute more than (70%) of all seizures. However, Bharucha et. al. have reported higher incidence of partial seizures (54.5%) than generalized seizures (45.4%) in Parsi community from Mumbai in India [11]. Pal et al 2010 neuroepidemiology of epilepsy in northwest India reported that generalized seizures are more frequent (67.5%) among idiopathic epilepsy. But in the symptomatic epilepsy patients, both generalized (49.5%) and partial seizures (50.5%) are almost equally frequent. More than 30% of newly diagnosed epilepsy cases were shown to be symptomatic by medical history as well as careful clinical and laboratory examination [12]. In our study 71% patients had generalized seizure while 29% have partial seizures and this was comparable to previous studies. The most common seizure pattern was generalized tonic clonic followed by simple partial seizures in our study and this is comparable to study by Joseph et al who found generalized tonic clonic seizures in 78.1% patients and this observation is also found by Avvaru et. al. [13,18]. Approximately 56% of all epilepsies were idiopathic and cryptogenic in our study and almost similar (60%) was found by Sridharan et al [19]. One study from Malaysia in 1999 on newly diagnosed epilepsy patients reported idiopathic epilepsy present in 78% and symptomatic epilepsy present in 22% patients [15]. However in localization related epilepsy, 23% were symptomatic and 4% of idiopathic epilepsy. In our study etiology was found in 42% of patients and most common cause is vascular in 15.57% followed by granuloma in 14%. In a study from Karnataka; head trauma, CNS infection and alcohol consumption were the most common cause of symptomatic epilepsy [13]. A study by Hussain A et. al. in Sudan reported CVA in 10% followed by CNS infection like meningitis and encephalitis in 5.9% of patients [14]. Neurocysticercosis was reported as common cause of epilepsy in 22% by Avvaru et. al. [18]. Many studies on seizures have revealed that NCC is a major cause of epilepsy in India. Murthy et. al. found that 10.4% patients had evidence of NCC [20]. Singhvi JP et. al., from the North Indian city of Chandigarh, found NCC as the cause of seizures in 31% of 158 patients [21]. In various studies causes seem to be dominated by head injury, birth trauma, and intracranial infections, such as neurocysticercosis or meningoencephalitis. In developed countries where socioeconomic status is

better, head trauma and stroke are the leading causes of epilepsy. Cases reported from China during 1994–2003 shows an average incidence of 8.7% for epilepsy with cerebrovascular disease and of 8% with post traumatic epilepsy [22]. The study from Hong Kong shows the commonest causes were cerebrovascular disease (26.2%), a history of CNS infection (26.0%), head trauma (11.4%), perinatal insult (9.7%), congenital brain malformation (7.4%), hippocampal sclerosis (5·9%), and intracranial neoplasm (5.6%) [23]. By contrast, in 300 incident cases of epilepsy in Nepal 47% were caused by neurocysticercosis, 9% by tumour, 4% by vascular disease, and 2% by head injury [24]. This we can say from our study and after review of various studies that with the development in all aspects of human being life, CNS infections including granulomatous lesion becomes less common cause for epilepsy as compare to vascular and post traumatic.

Radiological profile;

In our study we found that neuroimaging including CT and MRI were abnormal in 42.62% of patients although CT head was abnormal in only 2 patients and it was MRI that was abnormal in almost all of the patients. Vascular causes such as arterial or venous strokes were the most common one followed by granulomatous lesion. Murthy et. al. (1998) reported that childhood and juvenile absence epilepsies together formed a small proportion of epilepsy. Single CT enhancing lesion (SCTEL) and Focal cerebral calcification (FCC) were important etiologic factors for localization related epilepsies. The epilepsy associated with SCTEL was a form of benign epilepsy; epilepsy associated with FCC had remission rates similar to other remote symptomatic epilepsies [17]. Without neuroimaging evidence, these two lesions would have been missed and the patients might have been grouped under cryptogenic localization related epilepsy, hence it is mandatory in all localization related epilepsy to do an imaging.

Electroencephalographic profile;

The electrical activity recorded by surface scalp electrodes shows summation of excitatory and inhibitory post synaptic potentials in apical dendrites of pyramidal neurons in more superficial layers of cortex. There is also quite large area of few Centimeters Square required to produce electrical discharges to be recorded. Some deep areas of brain like basal frontal and mesial temporal could not be covered by scalp electrode. Due to above reasons and limited time of recording will explain the first EEG would be normal in many patients. The sensitivity of EEG is between 25-56% and specificity between 78-98% [26]. The normal EEG does not rule out epilepsy and neither abnormal interictal epileptiform discharges (IED) always found in epilepsy, it can be found in 0.5% of normal adults and 2-4% of children. 10% of epileptic patients never show any epileptiform discharges [26].

In our study, interictal EEG was abnormal in 37% of patients and the generalized epileptiform discharges were the commonest finding. Joseph et. al. found abnormal EEG pattern in 47% of cases. In various studies it was reported to be abnormal in 58.9% and 64.8% [14,25]. The reason for less number of abnormal EEG in our study could be the delay between EEG and seizure, not a long term recording and not frequent EEG to increase its sensitivity. Prolonged EEG will increase the yield by 20% and with availability of 24 hours ambulatory EEG this will increase further (Table 5).

Table 5: Pattern of etiology in study population

Etiology	Number	Percentage
Idiopathic	68	55.73%
Vascular	19	15.57%
Neurocysticercosis	11	9.00%
Tuberculoma	6	4.92%
Meningoencephalitis	5	4.09%
Tumour	4	3.27%
Posttraumatic	3	2.45%
MTS	3	2.45%
Pyogenic abcess	1	0.81%

In our study 70.49% of patients were on monotherapy and this is comparable to other previous studies [16,25,27]. The maximum patients were on sodium valproate (27.86%) followed by phenytoin (21.31%) because most of patients were having generalized seizures. There was 50% reduction in

seizure frequency on one year follow up found in 46% of patients and 36% of patients on drug did not show any seizure.

Conclusion

In this part of central India most of epilepsy patients belong to young age and males are more affected than female. The generalized seizures specially generalized tonic clonic seizure was more common than other types. Idiopathic epilepsy was more common as compared to symptomatic epilepsy. The most common causes were vascular followed by granuloma and higher percentage of patients had NCC as compare to tuberculoma. To increase EEG sensitivity we propose early, long duration EEG. Patient's compliance in this part of country is good made possible with good counseling regarding disease and its control with regular intake of appropriate drug. To control such a big burden of society patient as well as nearest available primary care physician should be made aware of early epilepsy recognition & management with continuous social and medical education program.

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