RESEARCH ARTICLE

An epidemiologic study of 389 children with epilepsy in southern Iran

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Abstract

Objective

Approximately 4% of the world's population experience one or more febrile seizures during their lifetime, and 0.5–1% of the population has active epilepsy. Less than one-third of the reported seizures are categorized as epilepsy. The cause of established epilepsy is important in determining the treatment and prognosis.

Materials & Methods

We studied 389 cases of documented epilepsy in children aged 2 months to 18 years who visited the hospital for neurologic examination during 2005–2010. Chi-square test or Fisher's exact test was performed for categorical variables.

Results

The most common age for the first seizure was below 2 years, and the most common type of epilepsy was generalized tonic–clonic seizure. Electroencephalography (EEG) showed an epileptic pattern in 60%, 29.8%, and 51% of the patients with idiopathic, symptomatic, and cryptogenic epilepsy, respectively. This pattern was significantly different among these 3 categories of epilepsy.

Conclusion

The most common type of seizure was cryptogenic; however, in most industrialized countries, idiopathic epilepsies were more frequent. With respect to the age and sex of patients, the prevalence of epilepsy in southern Iran is not so much different from that of patients in other parts of the world. As to generalized or partial epilepsy, there are different reports from different part of the world; however, generalized tonic-clonic seizures were more common in our area.

Keywords: Seizure; childhood epilepsy; epidemiology of convulsion

Introduction

Epilepsy is a common disease occurring worldwide and is among the most common chronic neurologic diseases diagnosed by neurologists (1, 2). Approximately 4% of the world's population experience one or more febrile seizures during their lifetime (3), and 0.5 - 1% of the population has active epilepsy (4).

A seizure is an episodic disturbance of movement, feeling, or consciousness, caused by sudden abnormal electrical activity in the cerebral cortex (5). Seizure occurs in 10% of children and is a commonly encountered problem. Most seizures in children are caused by fever, electrolyte imbalance, head trauma, and infection. Less

than one-third of the reported seizures are categorized as epilepsy (6); 2 or more unprovoked seizures with an interval of at least 24 h between them is defined as epilepsy (7). Determining the etiology of established epilepsy is important for treatment and prognosis.

Prevalence of epilepsy in Iran is about 1.8% (8), and in most countries worldwide, the prevalence ranges from 4 to 10 per thousand population (9); however, higher prevalence rates have been reported in Africa and South America (10).

Although seizure is a common cause of hospital admission of children in southern Iran (11), there is limited information on the demographic features, etiology, and electroencephalographic (EEG) and neuroimaging findings of epileptic children. The determination of these factors might be a useful guide for better management and probable prevention of epilepsy as well as for improving the quality of life in epileptic patients. This is especially important at our hospital, Shiraz University of Medical Science, which is a referral center for neurologic diseases in southern Iran—a region for which there is no available epidemiologic data on the above-mentioned factors.

Materials & Methoods

In this study, we collected the documented data of 389 children (aged 2 months to 18 years) who were diagnosed with epilepsy during 2005-2010 and were referred to Motahari Clinic affiliated to the Shiraz University of Medical Science. Epilepsy was diagnosed on the basis of the criteria specified by the International League Against Epilepsy (ILAE) (12, 13). The ILAE has classified the cause of seizures as remote symptomatic, cryptogenic, and idiopathic. Remote symptomatic seizures are those that can be attributed to an identifiable previous brain insult or encephalopathy such as mental retardation or cerebral palsy. Cryptogenic seizures have no definite cause and occur in otherwise normal individuals. However, idiopathic seizures are those that occur in individuals with suspected genetic epilepsy such as rolandic seizure (14, 15).

All 389 children had visited a pediatric neurologist and had been diagnosed with epilepsy on the basis of eyewitness reports of abnormal movement or gaze, description by parents, and results of EEG, and other clinical evaluations collected from reports of follow-up visits and patient medical records. Every effort was made to exclude patients suspected with pseudoseizure, syncope, breath-holding spell, and other conditions that mimic seizure.

All data, including age, sex, age of onset of seizure, birth history, perinatal insults, family history of epilepsy, history of infections, results of metabolic assays, presence of any provoking factor, results of EEG and neuroimaging, and history of anticonvulsant use, were collected. Chi-square test or Fisher's exact test was performed for categorical variables; data analysis with logistic regression was performed using the Statistical Package for the Social Sciences (SPSS).

Results

Of the 389 patients diagnosed with epilepsy, 210 (54%) were boys and 179 (46%) were girls (M/F ratio, 1.17). We found no association between the cause of epilepsy and sex.

The age of onset of seizure varied from birth up to 17 years; the most common age for the onset of seizure was less than 2 years (Chart-1), and the mean age for the onset of seizure was 4.7 ± 4.4 years. The duration between seizure and diagnosis of epilepsy was a maximum of 8 years, and the mean duration was 10 ± 4 months.

The type of seizures observed in the study cohort were as follows: 96 patients (24.6%) had partial seizures (simple or complex); 20 (5.1%), myoclonic seizures; 26 (6.7%), absence seizures; 38 (9.8%), atonic seizures; 277 (71.2%), generalized tonic–clonic seizures; 17 (4.4%), infantile spasm; 27 (6.9%), mixed-type seizures; and 3 (1%), unclassified seizures.

Ninety patients (23.1%) had idiopathic epilepsy; 189 (49.6%), cryptogenic epilepsy; and 110 (28.3%), symptomatic epilepsy.

The most common cause of the seizure was perinatal problems, such as asphyxia, sepsis, and neonatal hypoglycemia. Normal fetal development was reported in 251 patients (64.5%), whereas abnormal or delayed fetal development was reported in 137 (35.2%). There was a significant relationship between the causes of epilepsy and developmental delay; 82.7% of the patients with symptomatic epilepsy, 6.7% with idiopathic epilepsy, and 21.3% with cryptogenic epilepsy had developmental

delay. Parental consanguinity was reported in 26.2% of the patients, and 29% of them had a family history of epilepsy in their first- and second-degree relatives.

Of the 351 patients, 106 (27.2%) showed normal EEG patterns, 150 (38.6%) showed epileptic EEG patterns, and 95 (24.4%) showed abnormal but non-epileptic EEG patterns (Table-1).

The EEG showed significant difference in the epileptic patterns in 60%, 29.8%, and 51% of the patients with idiopathic, symptomatic, and cryptogenic epilepsy, respectively ($P < 0.05$). The non-epileptic EEG patterns did not show any significant differences among these 3 types of seizures.

Neuroimaging (computed tomography [CT] or magnetic resonance imaging [MRI]) was performed for 284 patients, of whom 201 (51.6%) showed normal imaging findings and 83 (21.3%) showed abnormal findings. Although 78.6% of the patients with symptomatic epilepsy and 4.5% with cryptogenic seizures showed abnormal neuroimaging findings, no such abnormal findings were reported in patients with idiopathic epilepsy (Table-2). The abnormal neuroimaging findings were significantly different among the 3 groups ($P \leq 0.05$).

Among the patients, 254 (63.3%) received 1 antiepileptic drug (AED), 72 (18.5%) received 2 drugs, and 23 (5.9%) received 3 drugs. Patients who received more than 2 AEDs and had more than 2 episodes of seizures per month were defined as having refractory seizures (36 patients [9.3%]).

Discussion

In our study, the most common age for onset of the first seizure was less than 2 years. In an epidemiologic study of epilepsy in children conducted in Tel Aviv in 1997, among 440 patients, the most common age for the onset of seizures was between 2 and 5 years (14). In contrast, an epidemiologic study conducted in Iceland and USA showed that age-specific incidence of seizures was highest among children in the first year of life (15, 16). Another study showed that the peak prevalence of seizures was between ages 0–4 years in boys but 40–59 years in women (17).

The difference in the prevalence of epilepsy among male and female patients was not significant. This observation in our study is in agreement with the observation in a large meta-analysis conducted in India (4) and another study in Minnesota (18). In a study in Sub-saharan African adults, male to female ratio was 1.4. This significant difference in the occurrence of seizures is explained by the tendency of women to hide their epilepsy and the large number of cases of head trauma in men (19). In 3 other reports from different areas worldwide, the incidence of epilepsy in men was found to be more than that in women (20, 21, 22). However, another study conducted on Iranian adults showed that epilepsy was more common in women than in men (8).

In our study, 29% of the patients had a positive family history of epilepsy among their first-degree relatives. Siblings of patients with epilepsy have a 2.5 times higher risk for epilepsy, and this risk increases in their offspring. The occurrence of epilepsy is also higher among monozygotic twins than among dizygotic ones (9).

The most common type of epilepsy in children was found to be generalized tonic-clonic seizure. However, in a study by Luengo et al in Madrid, partial seizures accounted for 64% of the total seizures (9). In another review, partial and generalized epilepsy were found to be equally prevalent before the age of 40, but after 40 years, the percentage of patients with partial seizures seemed to increase (10). In 1998, Kramer et al reported that partial seizures are slightly more common (52%) than primary or secondary generalized seizures (14). However, in our study, the incidence of absence and myoclonic seizures was comparable with that shown in the study by Kramer et al (14). As indicated earlier, some of the categorization of the type of seizure in our study was based on witness descriptions that might be error prone.

The most common type of epilepsy was cryptogenic, whereas in most industrialized countries, idiopathic epilepsies were more frequent (18). In this study, the most common cause of epilepsy was perinatal brain insult, This finding is consistent with the reports of Olafsson et al based on their study in Iceland in 2005 (15). In addition, another study showed that perinatal brain insults seemed to be the most common cause of seizures among children (16). However, in Latin America, neurocysticercosis has been reported to be more common than perinatal brain insult (23). We identified some other causes of seizures,

such as hyperbilirubinemia, encephalitis, meningitis, congenital central nervous system (CNS) infections, different anatomical and structural CNS abnormalities, head trauma, and metabolic disorders such as Tay-Sachs disease and mucopolysaccharidosis. The prognosis in children and adults with remote symptomatic epilepsy is worse than that in patients with cryptogenic or idiopathic seizures (24, 25).

Therefore, in addition to methodological variability, endemic factors such as tuberculosis, human immunovirus infection, encephalitis, and cysticercosis can explain the variability in epidemiological data on the type of epilepsy from different regions of the world (9). The high frequency of partial seizure with or without secondary generalization reported in some developing countries may account for the high incidence of symptomatic epilepsies in these countries (26).

Approximately 63% of the patients with epileptic seizures could be managed by administering 1 AED; however, 9.3% of the patients who received more than 2 AEDs had uncontrolled seizures. A previous study showed that 20% of the epileptic patients respond only partially to medication, and another 20% show little response to treatment (27). In another study in the USA, 7.7% of the children with epilepsy had refractory seizures (28).

Partial seizures with known cause and abnormal EEG (spike and wave) pattern are associated with poor prognosis for remission (4).

EEG showed epileptic pattern most frequently in patients with idiopathic epilepsy (60%), and least frequently in patients with cryptogenic epilepsy. This finding shows a direct relationship between the cause of epilepsy and EEG findings. In our study, epileptiform discharge, generalized spike and waves, focal spikes, or sharp waves followed by slow waves were evident in the EEG patterns of approximately 39% of the patients; however, abnormal but not epileptiform patterns were observed in the EEG patterns of 24% of the patients. These findings are similar to those of another study conducted in the USA (29).

Neuroimaging was performed for 284 (73%) patients and 21.3% of them showed abnormal imaging findings. Among patients with symptomatic epilepsy, 79% had abnormal findings, whereas among the patients with the 2 other types of epilepsy (idiopathic and cryptogenic), 0-4.5% showed abnormal neuroimaging findings. This significant difference was expected because of the causes of epilepsy and categorization of the types of epilepsy on the basis of the causes mentioned previously. MRI is considered the best imaging technique for patients with chronic epilepsy, and it is commonly used for identifying lesions in patients with chronic partial epilepsy (29). However, CT should be used in case of emergencies to detect hemorrhage, brain edema, or mass effect (30).

With regard to developmental indices in patients with epilepsy, those with symptomatic seizures had significantly more developmental delay ; this finding is consistent with the finding of a symptomatic seizure in which an identifiable previous brain insult is seen. Up to 25% of the patients with epilepsy have learning disability (LD) and up to 50% of the patients with LD have seizure disorders (31). Up to 90% of those with Lennox–Gastaut syndrome or West's syndrome may have LDs (32). Patients with seizure because of cardiovascular disorders and patients with idiopathic epilepsy had less frequent LDs; however, infective diseases of the CNS and neonatal hypoxic-ischemic brain damage were more frequently associated with LDs (33).

In conclusion, with respect to the age and sex of patients, the prevalence of epilepsy in southern Iran is not so much different from that of patients in other parts of the world. As to generalized or partial epilepsy, there are different reports from different part of the world; however, generalized tonic-clonic seizures were more common in our area. The most common type of seizure was cryptogenic; however, in most industrialized countries, idiopathic epilepsies were more frequent. However, in some developing countries, the prevalence of symptomatic epilepsy is more common because of specific causes such as neurocysticercosis. We hope to diagnose and control epilepsy more effectively by conducting further studies on the epidemiology of seizures in our area of study.

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Table 1: Electroencephalography (EEG) pattern in different causes of epilepsy

Cause	EEG		
	Normal (%)	Epileptic (%)	Abnormal but non-epileptic (%)
Idiopathic epilepsy	20.0	60.0	20.0
Cryptogenic epilepsy	40.4	29.8	29.8
Symptomatic epilepsy	21.0	51.0	28.0

Table 2: Prevalence of abnormal neuroimaging findings in different causes of epilepsy

Cause	Normal neuroimaging (%)	Abnormal neuroimaging (%)
Idiopathic epilepsy	100.0	0
Cryptogenic epilepsy	95.5	4.5
Symptomatic epilepsy	21.4	78.6

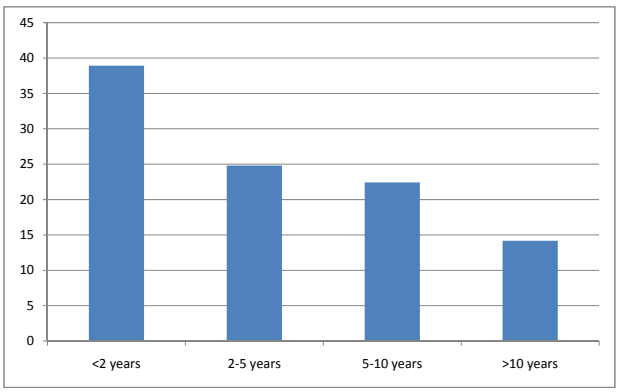

Fig1. Prevalence of seizure in different age groups

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