NEWLY DIAGNOSED SEIZURES IN ADOLESCENTS: A COMPARATIVE STUDY

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Objective: To study the clinical, EEG and CT profile in a hospital population of adolescents with newly diagnosed recurrent seizures.

Methods: The clinical profiles obtained from history including detailed descriptions of the seizures, examination, electroencephalographic (EEG) and computed tomography (CT) findings were recorded prospectively for all 14 to 18-year-old patients who were referred to the electrodiagnostic service at King Fahd Hospital of the University, Al-Khobar, Eastern Province, Saudi Arabia from 1st January 1996 to 31st December 1997. The data were entered into a standard dbase file and analyzed using a personal computer.

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computer. The results were compared with 2 previous concomitant subsets of data obtained from 263 children ≤13 years (72%) and 73 adults >18 years (20%) over the same study period.

**Results:** Twenty-nine patients (14 males and 15 females, a mean age of 15.7 years) with newly diagnosed recurrent seizures were studied. A positive family history of seizures was found in 10.3%. The main seizure types were partial in 11 (37.9%), partial with secondary generalization in 6 (20.7%) and generalized in 12 (41.4%). The types of epileptic syndromes included localization-related 15 (51.7%), generalized 12 (41.4%) and undetermined 2 (16.9%). The EEG was abnormal in 21 (72.4%) with epileptiform activity, focal in 11 (52.4%), generalized in 9 (42.8%) and none-epileptiform activity in 1 (4.8%). The cranial CT findings were normal in 21 patients (72.4%) and abnormal in 8 (27.6%) patients, with focal lesions in 6 (75%) and generalized cerebral atrophy in 2 (25%). The frequency of adolescents presenting with newly-diagnosed seizures was 8% of the total study population of 365 patients including children and adults.

**Conclusion:** The results showed that partial and partial with secondary generalization seizures and the localization-related epileptic syndrome are the most frequent seizure and epileptic syndrome types in adolescents. The least frequent of newly diagnosed seizures in adolescents compared to children and adults confirms the bimodality of peak frequency in the young and old that has been observed in the west.

**Key Words:** seizures, epilepsy, EEG, computed tomography, Saudi Arabia.

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**INTRODUCTION**

Epileptic seizures result from temporary self-limited abnormal hypersynchronous electrical discharges of cortical neurons leading to an altered state of brain function; whereas epileptic syndromes are chronic disorders characterized by unprovoked and usually unpredictable recurrent seizures.1,2 The International League Against Epilepsy (ILAE) played a major role in establishing and revising classifications for the different types of epileptic seizures and syndromes.3,5 The annual incidence of epileptic seizures ranges from 20 to 70 per 100,0006,7 and the point prevalence between 0.4 and 0.8%.8 The proper management of epileptic seizures and the prediction of outcome and prognosis are dependent on ascertaining the type of seizure, epileptic syndrome and the underlying causes.9 The latter are based primarily on the neurological history, examination, electroencephalogram (EEG) and neuro-imaging.2,10 Recent studies considered clinico-electrical, imaging and pathological patterns of certain epileptic syndromes in children.11 Similar prospective studies from our department examined the clinical patterns of newly-diagnosed seizures in children up to the age of 13 years2 and adults >18 years.13

The aim of the present study is to examine the clinical, EEG and CT profile in a hospital population of adolescent patients between 14 and 18 years of age, who were referred to the Neurodiagnostic Laboratories of King Fahd Hospital of the University (KFHU), Al-Khobar, Saudi Arabia, between January 1996 and December 1997, with newly-diagnosed recurrent unprovoked seizures and compare these results with those obtained from previous concomitant subsets of children and adults.

**METHODS**

Consecutive patients between the ages of 14 and 18 years with newly-diagnosed recurrent seizures were seen in the Neurodiagnostic
Laboratories of the Neurology Department at KFHU between January 1996 and December 1997. KFHU is a referral tertiary care hospital for the entire Eastern Province with an estimated population of three million. A pre-coded data form was completed to collect the relevant history, neurological examination and CT findings for every patient. Standard EEG records were obtained using a 2 1-channel Electroencephalograph (Model EEG-4421, Nihon Khoden Corporation, Tokyo, Japan). The same electroencephalographer read all the EEG records to minimize interobserver variability. The data were entered into a standard data base file using a personal computer and analyzed using the SPSS statistical package.

The present data from adolescents were compared with those obtained from two previous concomitant subsets, 12,13 of a children's group ≤ 13 years (N=263) and an adult group > 18 years of age (N=73).

RESULTS
A total of 29 patients, 14 males and 15 females (mean age 15.8 and 15.7 years respectively) were seen. The main clinical diagnoses were partial and complex partial seizures 11 (37.9%), partial with secondary generalization 6 (20.7%) and generalized seizure in 12 (41.4%). The main epileptic syndromes included localization related 15 (51.7%), generalized 12 (41.4%) and undetermined 2 (6.9%). It was noted that 24 (82.2%) of the patients presented within a year from the onset of seizures. A positive family history of seizures was present in 3 (10.3%). The EEG was abnormal in 21 (72.4%) patients. The abnormalities in this group included focal epileptiform activity in 11 (52.4%), generalized epileptiform activity in 9 (42.8%) and non-epileptiform in 1 patient (4.8%). Cranial computed tomography (CT) was normal in 21 patients (72.4%) and abnormal in 8 (27.6%) with focal lesions in 6 patients (75%) and generalized atrophy in 2 (25%). The frequency of the seizure and epileptic syndrome types and the EEG and CT abnormalities compared to the previous children and adult groups are given in Figures 1 and 2 respectively. The abnormal CT findings are given in Table 1. The generalized seizure type was predominant in the children's group, whereas the partial and secondarily generalized seizures were predominant in the adult and adolescent groups. As for the types of epileptic syndromes, the generalized and undetermined types were more frequent in the children's group compared to the localization-related type which was more frequent in the adolescent and adult groups. The percentages of abnormal EEGs were similar for the three groups forming approximately two thirds of the total. However, the abnormal epileptic activity was equally distributed between focal and generalized in the adolescent group compared to predominantly generalized in the children group and predominantly focal in the adult group. As for the cranial CT abnormalities, cerebral atrophy was commonest in the children's group compared to focal abnormalities in the adolescent and adult groups. The frequency of newly-diagnosed seizures in adolescents was 8% of the total study population, ranking the least compared to the children's group (72%) and adult group (20%) over the same study period.

Table 1: Cranial CT findings in 29 patients (14-18 year old) with newly diagnosed seizures

| Finding          | Number (%) |
|------------------|------------|
| Cerebral atrophy | 2 (7.0)    |
| Ischemic infarct | 1 (3.4)    |
| Intracranial calcification | 2 (7.0) |
| Subdural hematoma| 1 (3.4)    |
| Hydrocephalus    | 1 (3.4)    |
| Porencephaly     | 1 (3.4)    |
| Normal           | 21 (72.4)  |
| **Total**        | **29 (100)**|

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DISCUSSION
In order to make the right diagnosis, select the appropriate anti-epileptic drug and consider the underlying possible etiologies with a view to predict prognosis and outcome, classification of types of epileptic seizures and syndromes is mandatory.2,10,14,15 The lower number of patients in this age group compared to the children and adults groups over the same study period probably reflects...
the variation of incidence as shown in a Canadian study where the highest incidence was in the under one-year-old (118/100,000), 46/100,000 for 1 to 10-year-old and 21/100,000 for 11 to 15-year-old. A similar decline in incidence with age was also observed in a study done in USA. Our results also reflect a delay in diagnosis where 82.2% of patients presented within a year compared to the 50% reported by Gumnit. A similar decline in incidence with age was also observed in a study done in USA. Our results also reflect a delay in diagnosis where 82.2% of patients presented within a year compared to the 50% reported by Gumnit.

The proportion of patients with partial and partial with secondary generalization (58.6%) and generalized (41.4%) were similar to the results of 52% and 39% respectively published by the British National General Practice population-based study in newly-diagnosed epileptic seizures. The distribution of epileptic syndromes in our patients was localization-related (51.7%), generalized (41.4%) and undetermined (6.9%) shows a similar trend to those reported from the UK where 58% were localization-related, 23% generalized and 19% undetermined. The EEG was abnormal in 72% of our patients compared to 68% in the UK study. The abnormal epileptic activity for adolescents was focal epileptiform in 34.5%, generalized in 48.3% and non-epileptiform in 17.2% showing a closer similarity to the adult group with focal activity in 48.9% and the children's group with generalized activity in 50.6%. However, the EEG showed considerable variations and overlap among the different seizure types as previously reported.

The cranial CT abnormalities were present in 27.6% compared to 39.5% in children and 39.7% in adults. However, whereas cerebral atrophy was the main CT finding (64%) in children, focal abnormalities were predominant (75%) in adolescents compared to 65.5% in adults. Furthermore, the cranial magnetic resonance imaging (MRI), functional and quantitative, is currently considered the neuroimaging method of first choice for patients with epilepsy. In one study, 98 out of 111 children and adolescents with partial epilepsy, had both cranial CT and MRI. Of these, 31% had negative CT and positive MRI lesions that most likely account for their epilepsy.

Our results showed that partial and partial with secondary generalization seizures are the most frequent seizure types; and the commonest epileptic syndrome was the localization-related type in this adolescent group. Thus, they are comparable to the adult results and previous population- and hospital-based reports. The least frequent of newly diagnosed seizures in adolescents (8%) compared to children (72%) and adults (20%) over the same study period confirm the bimodality of peak frequency of newly-diagnosed seizures in the young and old as previously reported in the West.

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