

Original Article

Spectrum of attention deficit hyperactivity disorders (ADHD) among Sudanese children with epilepsy

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ABSTRACT

Epilepsy is commonly encountered in children with attention deficit hyperactivity disorder (ADHD). This study aims to determine the spectrum of ADHD among Sudanese children with epilepsy. The study was conducted at the Epilepsy and Neurodisabilities Outpatient Clinic for Children at Saad Abu Elila University Hospital, Khartoum, Sudan during the period January - July 2013. All patients with epilepsy who presented to the clinic during the study period were assessed for ADHD using psychometric questionnaire. According to the interpretation guide, the degree of probability of ADHD was identified. Out of 720 patients with epilepsy 77(10.6%) were identified as having ADHD. Of these 50 (19.50%) patients had a high probability of having ADHD, 29 (37.70%) above average, 29 (37.70%) average and 4 (5.20%) had low ADHD spectrum.

Keywords:

Attention deficit hyperactivity disorder; Epilepsy; Children; Sudan.

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INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood. It is characterized by; hyperactivity, impulsivity, and inattention [1,2]. Besides other comorbid disorders, epilepsy is commonly encountered in children with ADHD. The prevalence of ADHD in children in the general population is 5-7%, whereas in children with epilepsy it is 20-40% [3,4]. Several factors contribute to the co-morbidity of ADHD with epilepsy, including the underlying brain pathology, genetic predisposition, and chronic effects of seizures, antiepileptic drugs, stimulants, and psychosocial factors. The ADHD has its social, economical and psychological impact on the family and the community. This burden is especially worse if ADHD is associated with epilepsy [5]. This study aims to determine the spectrum of ADHD among Sudanese children with epilepsy.

PATIENTS AND METHODS

This is a cross-sectional, descriptive hospital-based study, conducted at the Epilepsy and Neurodisabilities Outpatient Clinic for Children at Saad Abu Elilela University Hospital, Khartoum, Sudan during the period January - July 2013. The age of the study group ranged between 5 and 17 years. All patients with epilepsy presented to the clinic were assessed for ADHD using ADHD Test. This test describes standard scores, percentile ranks, severity levels, and probability of ADHD [6]. The ADHD Test has three categories: 1- Hyperactivity (score from 0 to 26) which contain 13 items. 2- Impulsivity (score from 0

to 20), which contain 10 items. 3- Inattention (score from 0 to 22) which contains 11 items. The sum of the score for each category was plotted in the Converting Raw Scores to Standard Scores and Percentiles for males and females. The sum of the standard scores for the three categories (hyperactivity, impulsivity and inattention) was plotted in the Converting Sum of Standard Scores to ADHD Quotient and Percentile Rank. According to the interpretation guide, the degree of the probability of ADHD was identified according to the ADHD Quotient; it includes seven categories ranging from very high probability to have ADHD to very low according to the degree of severity.

All patients who have a probability of ADHD were assessed using a designed questionnaire. The Questionnaire addressed the socio-demographic data, seizure history, Anti-epileptic Drugs (AEDs) and other drugs history in addition to the associated comorbidity.

Ethical approval was obtained from the ethics committee of the Sudanese Medical Specialization Board. Verbal consent was taken from the parents or caregiver after explaining the aim of the study in a simple Arabic language. Data was analyzed using SPSS version 16.

RESULTS

A total of 720 patients with epilepsy were assessed for ADHD, 77 (10.6%) were identified as having ADHD. Fifty (19.5%) patients had high probability of ADHD, 29 (37.7%) above average, 29 (37.7%) average and 4 (5.2%) had low probability to have ADHD as shown in Table 1.

Table 1 - The probability of attention deficit hyperactivity disorder among 77 children with epilepsy

ADHD probability	Number (%)
High	15(19.4)
Above average	29(37.7)
Average	29(37.7)
Low	04(05.2)
Total	77(100)

ADHD – Attention deficit hyperactivity disorder

The age ranged from 5 to 17 years; however, the majority 30 (39.00%) were in the age group 6-8 years. The male to female ratio was 3:1. All patients had an EEG which showed generalized epileptiform activity in the majority 55(71.4%) of patients. MRI of the brain was done to all patients, 31 (40.0%) had a normal brain image, 20(26.0%) had diffuse brain atrophy, and 9 (11.7%) showed structural brain anomalies. Thirty Six patients (46.8%) had delayed or missed educational opportunities while 41patients (53.2%) were involved in formal governmental schools, with

learning difficulties and poor performance. Thirty seven patients (48.1%) had epilepsy for more than three years, 36 (46.80%) for 2-3 years while four (5.20%) had epilepsy for less than 6 months. There is no statistically significant relationship between duration of seizures and probability of ADHD as shown in Table 2. Sixty-three (81.8%) patients had generalized seizures, while 14 (18.2%) had focal seizures. There is no statistically significant relationship between the type of seizures and the probability of ADHD as shown in Table 3.

Table 2 - Relation between spectrum of attention deficit hyperactivity disorder and duration of epilepsy

Probability of ADHD	Duration of seizure			Total N (%)
	6 mo-2yrs N (%)	2-3 yrs N (%)	> 3 yrs N (%)	
High	0 (0.0)	5 (33.3)	10 (66.7)	15 (100.0)
Above average	4 (13.8)	9 (31.0)	16 (55.2)	29 (100.0)
Average	0 (0.0)	21 (72.4)	8 (27.6)	29 (100.0)
Low	0 (0.0)	1 (25.0)	3 (75.0)	4 (100.0)

ADHD – Attention deficit hyperactivity disorder
 P < 0.004

Table 3 - Relation between spectrum of attention deficit hyperactivity disorder and type of seizure

Probability of ADHD	Type of seizure		Total N (%)
	Focal N (%)	Generalized N (%)	
High	1 (6.7)	14 (93.3)	15 (100.0)
Above average	6 (20.7)	23 (79.3)	29 (100.0)
Average	6 (20.7)	23(79.3)	29 (100.0)
Low	2 (50.0)	2 (50.0)	4 (100.00%)

ADHD – Attention deficit hyperactivity disorder
 P value = 0.262

Thirty-Seven patients (48.1%) were on monotherapy, 26 (33.8%) on two AEDs, and 14 (18.2%) patients were on polytherapy. There is no statistical

significance between the number of AEDs used and the probability of having ADHD (P value = 0.635) as shown in Table 4.

Table 4 - Relation between spectrum of attention deficit hyperactivity disorder and number of anti-epileptic drugs used

Probability of ADHD	Monotherapy N (%)	2 AEDs N (%)	Polytherapy N (%)	Total N (%)
High	5 (33.30%)	5 (33.30%)	5 (33.30%)	15 (100.00%)
Above average	16 (55.20%)	9 (31.10%)	4 (13.80%)	29 (100.00%)
Average	14 (48.30%)	10 (34.50%)	5 (17.20%)	29 (100.00%)
Low	2 (50.00%)	2 (50.00%)	0 (0.0%)	4 (100.00%)

ADHD – Attention deficit hyperactivity disorder, AEDs - Anti-epileptic drugs

P value = 0.635

Thirty-five (45.5%) patients were on Sodium valproate, 17 (22.0%) on carbamazepine, 15 (19.5%) on lamotrigine, 7 (9.0%) on topiramate and 3 (4.0%) on clonazepam. Patients on sodium valproate had a high probability of ADHD, in comparison to other AEDs (P- value < 0.05) as shown in Table 5. Only three (3.90%) patients were on methylphenidate tablets in addition to AEDs.

Table 5 - Relation between probability of attention deficit hyperactivity disorder and type of anti-epileptic drugs [n=77]

Drug	Probability of ADHD	Yes, N (%)	No, N (%)	P value
Sodium valproate	High	15 (100.0%)	0 (0)	0.076
	Above average	24 (82.00%)	05 (17.20%)	
	Average	25 (86.20%)	04 (13.80%)	
	Low	02 (50.00)	02 (50.00%)	
Lamotrigine	High	05 (33.30%)	10 (66.70%)	0.440
	Above average	5 (17.20%)	24 (82.80%)	
	Average	7 (24.10%)	22 (75.90%)	
	Low	03 (75.00%)	1 (25.00%)	
Clonazepam	High	04 (26.70%)	11 (37.30%)	0.295
	Above average	05 (17.20%)	24 (82.80%)	
	Average	10 (34.50%)	19 (65.50%)	
	Low	0.00 (0%)	04 (100.00%)	
Topiramate	High	0 (0.0%)	15 (100.00%)	0.880
	Above average	01 (3.40%)	28 (96.60%)	
	Average	01 (3.40%)	28 (96.60%)	
	Low	0 (0.00%)	04 (100.00%)	
Others	High	01 (6.70%)	14 (93.30%)	0.171
	Above average	0 (0.0%)	29 (100.00%)	
	Average	02 (6.90%)	27 (93.10%)	
	Low	01 (25.00%)	03 (75.00%)	

ADHD – Attention deficit hyperactivity disorder, AEDs - Anti-epileptic drugs

DISCUSSION

Melchior Weikard, a German physician, in 1775 wrote in his book a term of ADHD- like behaviour and described symptoms of distractibility, poor persistence and impulsive actions which were quite similar to the inattentive dimension of ADHD in the DSM-IV [7]. The criteria for the diagnosis of attention deficit hyperactivity disorder have been defined by the American Psychiatric Association and published in the DSM-IV [8]. Important features include: symptoms must be present in more than one setting, persist for at least six months and present before the age of seven years. Bennet-Back and his colleagues suggested that the relationship between ADHD and paediatric epilepsy is not random, and instead may reflect a common underlying causative aetiology. The possible mechanisms they outline include hereditary factors with a common propensity to both conditions that may alter the levels of various brain neurotransmitters or may affect brain plasticity, neurogenesis, and apoptosis [9-12].

The prevalence of ADHD in children in the general population is 5-7%, whereas in children with epilepsy it is 10-40% [13,14]. In the present study, 77 patients out of 720 with diagnosis of epilepsy, had ADHD which accounted for 10%. This is similar to what had been mentioned by Dunn et al [3] and Austin et al [15] showing that children with epilepsy had prevalence of ADHD much higher than in the general paediatric population, reaching 8%.

Although in our study there is statistically significant relationship between the duration of seizure and the severity of ADHD, Austin et al [15] investigated the presence of behaviour problems in children prior to their first recognized seizure and they found these children were already at an increased risk for behaviour problems at the time of their first recognized seizure. Hesdorffer and colleagues [5] found a history of clinical ADHD diagnosis was 2.5 times more likely in children with newly diagnosed seizures than among

controls.

The majority of our patients had generalized seizures type, however it is well known that children with benign childhood epilepsy with centrotemporal spikes (BCECTS), complex partial seizures (CPS), frontal lobe epilepsy or focal epileptic seizures may be more likely to have symptoms of ADHD [16,17].

Children with ADHD have a higher than normal rate of EEG abnormalities without history of epilepsy [18]. Such epileptiform discharges are reported to be associated with cognitive impairment and manifestation of ADHD symptoms [14] and in such cases some have shown that antiepileptic use may abolish epileptiform discharges and even improve ADHD symptoms [19]. However, there are certain antiepileptic drugs that adversely affect the attention and behaviour even when used within their therapeutic ranges, such as phenobarbitone, gabapentin, and topiramate. The majority of our patients were on sodium Valproate and they were found to have significantly higher probability of ADHD compared to patients on carbamazepine, clonazepam and lamotrigine. Schubert [20] reported that in cases where epilepsy and ADHD are comorbid, carbamazepine and lamotrigine may be more beneficial compared to other antiepileptic drugs by their effects on attention and behaviour [20].

Only 3.9% of our patients were receiving methylphenidate for ADHD, which is similar to what had been mentioned by Hemmer et al [21]. However many of the researches suggest that methylphenidate does not increase seizure threshold, a belief that, at one time, caused concern with regard to treating a child with epilepsy and attention problems with a stimulant. Theoretically, the treatment of ADHD with stimulants, such as methylphenidate, is likely to increase the risk of seizure by lowering seizure threshold [21]. However, a study conducted by Santos et al [22], Showed that after 3 months of treatment with methylphenidate, 73% of patients no longer had

clinically significant symptoms with reduced seizure severity and most of them experienced no major side effects.

Almost half of our patients had delayed or missed educational opportunities in addition to learning difficulties. Millichap et al [23] found that learning disability was more common in children with ADHD, with higher risk for reading disability or phonologic

awareness deficit.

CONCLUSION

Children with epilepsy have more chances to have ADHD. All children with epilepsy should be assessed for ADHD and early involvement of psychologist together with medical treatment is needed.

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