Depression among school aged epileptic children and their siblings

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Introduction

Researches on children and adolescents with epilepsy have revealed a high incidence of psychological and behavioral difficulties. For a longtime, patients and physicians tended to focus solely on the control of epileptic seizures, while disregarding the presence of comorbid psychiatric symptoms and disorders. Recognition of their negative impact in the life of patients with epilepsy in recent years has highlighted the need for the early identification of psychiatric symptoms.

Aim of the work

The work aimed to study the prevalence of depression in school aged epileptic children and their siblings and to study the possible risk factors of depressive disorders in those children with epilepsy and their siblings.

Patients and methods

The study included 150 school children divided into three groups: epileptic children, their siblings, and a healthy control group. They have been all subjected to history taking, neurological examination, psychiatric interview, electroencephalography, and psychometric assessment using Children's Depression Inventory, Arabic form.

Results

We found a significant relationship between the prevalence of depression and focal seizures ($P < 0.001$) especially frontal and temporal lobe epilepsy; however, we did not find a statistically significant relationship between depression and other seizures related risk factors. There was a significantly ($P = 0.002$) poor school performance among epileptic children (42%) compared with their siblings (16%) and the control children (12%), and also there was a significant relationship between poor school performance in epileptic children and high prevalence of depression ($P = 0.025$) among these children.

Conclusion

There is no great impact of epilepsy on the social or psychological life of the siblings especially among young children. Despite the high prevalence of depression among young epileptic children, it was not statistically significant compared with the control children. Moreover, there is a significant relationship between focal seizures and depression especially temporal and frontal lobe epilepsy. Depression as a comorbidity in epileptic children further compromises their school performance.

Keywords:
anxiety, depression, epilepsy, psychiatric, school performance, seizure

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Introduction

Various investigations focusing on the prevalence of psychopathology in pediatric epilepsy have documented that children with epilepsy have an estimated overall risk of 21–60% for childhood psychopathology (Ott *et al.*, 2001, 2003). This is at least three to six times higher than the risk for psychopathology in the general pediatric population (i.e. 6.6%) and among children with a chronic medical condition not involving the central nervous system (i.e. 11.6%) (Ekinci *et al.*, 2009). Prevalence rates of psychiatric comorbidities have been found to be significantly higher in focal epilepsy, particularly in temporal lobe epilepsy (TLE) or in frontal lobe epilepsy. Depression in patients with epilepsy frequently differs from those of patients without epilepsy and is commonly classified as 'atypical'. The characteristic of depressive disorders in epilepsy is the temporal relation of their symptoms to that of seizure occurrence; thus symptoms can be classified as preictal (preceding seizures by up to 2 days), ictal (being an expression of the actual seizures or the aura), interictal (occurring independently from seizures), and postictal (occurring any time within the first 5 days following seizures) (Morales *et al.*, 2008). Suicidality (completed suicide, suicide attempt, and suicidal ideation), is significantly more frequent among people with epilepsy than in the general population. Yet, it remains under-recognized and untreated (Rafnsson *et al.*, 2001; Jones *et al.*, 2003; Christensen *et al.*, 2007).

Siblings have less psychological problems than their brothers or sisters with epilepsy but they were more

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disturbed than children in the general population. Interestingly, siblings of children with chronic epilepsy are more affected than those of the newly diagnosed children (Otero, 2009). Despite the recognition of the relative frequent comorbidity of depression in epilepsy and its negative impact on the patients' quality of life, they usually go undetected and untreated (Quinn *et al.*, 2006). Early detection allows the physician to choose the proper anti epileptic drugs (AED) in conjunction with other therapeutic interventions necessary to cause an optimal remission of seizures and psychiatric comorbidity (Morales *et al.*, 2008).

In the present study, we studied the prevalence of depression in school aged epileptic children and their siblings and its possible risk in those children with epilepsy and their siblings.

Aim of the work

The work aimed to study the prevalence of depression in school aged epileptic children and their siblings and to study its possible risk factors in those children with epilepsy and their siblings.

Patients and methods

This cross-sectional study was conducted on 100 children who have been recruited from El-Shatby neurology outpatient clinic and neurology outpatient clinic of health insurance institution (Semoha clinic) and 50 control children who were recruited from Shawkat El-Tagrebya preparatory school. The children were divided into three groups:

(1) *Group 1*: Include 50 school children (index participants) diagnosed with idiopathic epilepsy, aged 6–10 years, received antiepileptic medication and having one sibling or more. Children showing clinical evidences of neurological deficit, chronic medical or surgical disorders, and abnormal imaging findings were excluded.
(2) *Group 2*: Include 50 siblings to the index participants matched for age and living in contact with their sibling at the same socioeconomic status and having no chronic medical or surgical disorders.
(3) *Group 3*: Include 50 normal control children (the sample was obtained from Shawkat El-Tagrebya primary school) matched for age, sex, socioeconomic status with the index participants and having no chronic medical or surgical disorders.

All children were undergoing the following: firstly: history taking, child psychiatric interview according to the DSM-IV-TR; 10 full neurological and physical examination and informed consent. Secondly: psychometric assessment using Kovac Children's Depression Inventory (CDI), Arabic form.

All the epileptic children were undergoing the following:

Full history of epileptic seizures include the following: age of onset (first attack), last attack, frequency of attacks, preictal (aura), type of seizures, postictal events, duration of seizures, and response to therapy and medication (monotherapy or polytherapy). Electroencephalography will be conducted only if there were no recent ones in the last 6 months.

Statistical analysis

Data were analyzed using software package version 18.0 (SPSS Inc., Chicago, Illinois, USA). Test of normality was applied on the data by using Kolmogorov–Smirnov test, Shapiro–Wilk test also D'Agstino. Quantitative data were expressed using range, mean, SD, and median while qualitative data were expressed in frequency and percent. Qualitative data were analyzed using χ^2-test and also exact tests such as Fisher exact and Monte Carlo were applied to compare different groups. Quantitative data were analyzed using Student *t*-test to compare between two groups while *F*-test (analysis of variance) was used to compare the three categories of outcome. Not normally distributed quantitative data were analyzed using Mann–Whitney test for comparing two groups. *P* value was assumed to be significant at 0.05.

Results

Descriptive data of the three studied groups:

As regard to the sex and age of children in this study it is shown in Table 1.

The family history as regard the consanguinity, epilepsy, psychiatric disorders, and marital status is shown in Table 2.

Clinical data studied among epileptic children including the age of onset of seizures, the type of seizure, response to medication and medications are shown in Table 3.

The distribution of the studied cases according to drugs used in the epileptic group is shown in Table 4.

Table 1 Comparison between the three studied as regard age and sex

Age and sex	Epileptics [*n* (%)]	Siblings [*n* (%)]	Control [*n* (%)]	Test of significance
Sex				
Male	32 (64.0)	27 (54.0)	27 (54.0)	1.363 $P = 0.506$
Female	18 (36.0)	23 (46.0)	23 (46.0)	
P_1		0.309	0.309	
P_2			1.000	
Age				
Range	6.0–10.0	6.0–10.0	6.0–10.0	$F = 1.708$ $P = 0.185$
Mean ± SD	9.10 ± 1.27	8.78 ± 1.34	9.20 ± 0.90	
Median	10.0	9.0	9.0	
$^{LSD}P_1$		0.176	0.674	
$^{LSD}P_2$			0.079	

LSD, least significance difference of post-hoc test; *F*, *F*-test (analysis of variance); P_1, *P* value between epileptics and other groups; P_2, *P* value between siblings and control.

Table 2 Comparison between epileptics and control group according to family history of consanguinity, epilepsy, psychiatric, mental disorder and family marital status

Family history	Epileptics [*n* (%)]	Control [*n* (%)]	Test of significance
Consanguinity			
Negative	40 (80.0)	44 (88.0)	1.190 $P = 0.275$
Positive	10 (20.0)	6 (12.0)	
History of epilepsy			
Negative	40 (80.0)	50 (100.0)	$P_{FE} = 0.001$*
Positive	10 (20.0)	0 (0.0)	
History of psychiatric and mental disorder			
Negative	46 (92.0)	49 (98.0)	$P_{FE} = 0.362$
Positive	4 (8.0)	1 (2.0)	
Marital status			
Married	47 (94.0)	44 (88.0)	$P_{mc} = 0.593$
Divorced	2 (4.0)	3 (6.0)	
Widow	1 (2.0)	3 (6.0)	

P_{FE}, *P* value for Fisher exact test; P_{mc}, *P* value for Monte Carlo test; *Statistically significant at $P \leq 0.05$.

Table 3 Distribution of clinical data of studied epileptic children

Clinical data	*n* (%)
Type of seizures	
generalized tonic clonic (Gtc)	25 (50.0)
Atonic	9 (18.0)
Absence	6 (12.0)
Focal second generalization	4 (8.0)
Complex partial	4 (8.0)
Simple partial	2 (4.0)
Response	
Uncontrolled	27 (54.0)
Controlled	23 (46.0)
Medication	
Polytherapy	40 (80.0)
Monotherapy	10 (20.0)
Age of onset of seizures (months)	
Range	1.0–60.0
Mean ± SD	34.04 ± 29.58
Median	60.0

GTC, generalized tonic clonic.

Assessment of the school performance of the three studied groups using the school grades records is shown in Table 5.

The prevalence of depression among the three studied groups

Using the Kovac CDI, Table 6 shows the comparison between the three studied groups as regard depression (Table 7).

Possible risk factors of depression in epileptic children in our study

Table 8 shows the relation between degree of depression and demographic data of the studied group.

Table 9 as well shows the relation between the degree of depression and family history as regard family history of epilepsy, consanguinity, marital status, and psychiatric disorders.

Table 10 shows the relation between the degree of depression and the clinical data of the studied epileptic children as regard type of seizures, response to therapy, medications, and age of onset of seizure.

The relation between the degree of depression and medications used is shown in Table 11.

There was a significant relationship ($P = 0.025$) between depression in epileptic children and poor school performance as shown in Table 12.

Discussion

In the current study, the prevalence of depression among the siblings of the epileptic children was: two of the 50 siblings had mild depression (4%) on CDI scale. This was consistent with the result of another study by Wood *et al.* (2008) as 37 siblings (aged 6–18 years) of children with intractable epilepsy were surveyed regarding anxiety, depression, and quality of life, by both self-report (Revised Children's Manifest Anxiety Scale; CDI) and parental report (Child Behavior Checklist). No sibling had a score in the clinical

Table 4 Distribution of studied cases according to drugs used in the epileptic group

Drugs used in epileptic group	*n* (%)
Drugs	
Sodium valproate	39 (78.0)
Carbamazepine	14 (28.0)
Topiramate	4 (8.0)
Lamotrigine	2 (4.0)
Phenytoin	2 (4.0)
Clonazepam	1 (2.0)

Table 5 Comparison between the three studied groups according to school performance

School performance	Epileptics [*n* (%)]	Siblings [*n* (%)]	Control [*n* (%)]	*P*
Poor	21 (42.0)	8 (16.0)	8 (16.0)	12.126* (0.002)
Good	29 (58.0)	42 (84.0)	42 (84.0)	
P_1		0.004*	0.004*	
P_2			1.000	

P_1, *P* value of χ^2-test between epileptics and other groups; P_2, *P* value of χ^2-test between siblings and control; *Statistically significant at $P \leq 0.0$.

Table 6 Comparison between the three studied groups according to Children's Depression Inventory score

Depression prevalence	Epileptics [*n* (%)]	Siblings [*n* (%)]	Control [*n* (%)]	*P*
CDI				
None	41 (82.0)	48 (96.0)	44 (88.0)	4.909 (0.086)
Mild	9 (18.0)	2 (4.0)	6 (12.0)	
P_1		0.051	0.557	
P_2			0.269	

CDI, Children's Depression Inventory; P_1, *P* value of χ^2-test between epileptics and other groups; P_2, *P* value of χ^2-test between siblings and control.

Table 7 Relation between Children's Depression Inventory and demographic data

Demographic data	CDI		Test of significance
	None (*n* = 41) [*n* (%)]	Mild (*n* = 9) [*n* (%)]	
Sex			
Male	26 (63.4)	6 (66.7)	P_{FE} = 1.000
Female	15 (36.6)	3 (33.3)	
Age			
Range	6.0–10.0	6.0–10.0	*t* = 0.317 *P* = 0.753
Mean ± SD	9.07 ± 1.27	9.22 ± 1.30	
Median	10.0	10.0	

CDI, Children's Depression Inventory; P_{FE}, *P* value for Fisher exact test; *t*, Student *t*-test.

range on the CDI in their study. The study concluded that siblings of children with intractable epilepsy are functioning well overall and have a good quality of life.

It was found that, there is no increase in the prevalence of depression among the siblings of epileptic children compared with the control group. Although we

Table 8 Relation between Children's Depression Inventory and demographic data

Demographic data	CDI		Test of significance
	None (*n* = 41) [*n* (%)]	Mild (*n* = 9) [*n* (%)]	
Sex			
Male	26 (63.4)	6 (66.7)	P_{FE} = 1.000
Female	15 (36.6)	3 (33.3)	
Age			
Range	6.0–10.0	6.0–10.0	*t* = 0.317 *P* = 0.753
Mean ± SD	9.07 ± 1.27	9.22 ± 1.30	
Median	10.0	10.0	

CDI, Children's Depression Inventory; P_{FE}, *P* value for Fisher exact test; *t*, Student *t*-test.

Table 9 Relation between Children's Depression Inventory and family history of consanguinity, family history of epilepsy, marital status, and history of psychiatric/mental disorder

Family history	CDI		P_{FE}
	None (*n* = 41) [*n* (%)]	Mild (*n* = 9) [*n* (%)]	
Consanguinity			
Negative	35 (85.4)	5 (55.6)	0.065
Positive	6 (14.6)	4 (44.4)	
Family history of epilepsy			
Negative	31 (75.6)	9 (100.0)	0.174
Positive	10 (24.4)	0 (0.0)	
History of psychiatric and mental disorder			
Negative	38 (92.7)	8 (88.9)	0.560
Positive	3 (7.3)	1 (11.1)	
Family marital status			
Married	39 (95.1)	8 (88.9)	P_{MC} = 0.449
Divorced	1 (2.4)	1 (11.1)	
Widow	1 (2.4)	0 (0.0)	

CDI, Children's Depression Inventory; P_{FE}, *P* value for Fisher exact test; P_{MC}, *P* value for Monte Carlo test.

Table 10 Relation between Children's Depression Inventory and clinical data of the studied epileptic children

Clinical data	CDI		Test of significance
	None (*n* = 41) [*n* (%)]	Mild (*n* = 9) [*n* (%)]	
Type of seizures			
Generalized	39 (95.1)	1 (11.1)	P_{FE} < 0.001*
Focal	2 (4.9)	8 (88.9)	
Response to therapy			
Uncontrolled	20 (48.8)	7 (77.8)	P_{FE} = 0.152
Controlled	21 (51.2)	2 (22.2)	
Medication			
Polytherapy	33 (80.5)	7 (77.8)	P_{FE} = 1.000
Monotherapy	8 (19.5)	2 (22.2)	
Age of onset of seizures			
Range	0.25–8.0	0.50–8.0	*Z* = 0.166*P* = 0.868
Mean ± SD	3.19 ± 2.08	3.22 ± 2.62	
Median	3.0	2.0	

CDI, Children's Depression Inventory; P_{FE}, *P* value for Fisher exact test; *Z*, *Z* for Mann–Whitney test; *Statistically significant at $P \leq 0.05$.

Table 11 Relation between Children's Depression Inventory and drugs

Drugs	CDI		P_{FE}
	None (n = 41) [n (%)]	Mild (n = 9) [n (%)]	
Drugs			
Sodium valproate	32 (78.0)	7 (77.8)	1.000
Carbamazepine	11 (26.8)	3 (33.3)	0.697
Topiramate	4 (9.8)	0 (0.0)	1.000
Phenytoin	2 (4.9)	0 (0.0)	1.000
Lamotrigine	1 (2.4)	1 (11.1)	0.331
Clonazepam	0 (0.0)	1 (11.1)	0.180

CDI, Children's Depression Inventory; P_{FE}, P value for Fisher exact test.

Table 12 Relation between Children's Depression Inventory and school performance

School performance	CDI		P_{FE}
	None (n = 41) [n (%)]	Mild (n = 9) [n (%)]	
Poor	14 (34.1)	7 (77.8)	0.025*
Good	27 (65.9)	2 (22.2)	

CDI, Children's Depression Inventory; P_{FE}, P value for Fisher exact test; *Statistically significant at $P \leq 0.05$.

expected greater psychological impacts on the life of siblings of epileptic children, these results could be explained by a number of suggestions including the following:

(a) There might be a denial from those children to express their feelings especially in front of their parents.
(b) They have not been neglected by their overburdened parents, as most of the parents in our study were educated and with average socioeconomic status and with intact family structure.
(c) We also noticed while interviewing the siblings that some of them, especially the older ones, were very supportive and believed that their siblings with epilepsy will get better, whereas the younger siblings did not fully understand the nature of his brother's or sister's illness.
(d) All the siblings included in this study had no chronic medical or surgical conditions that exclude the emotional impact of the chronic illness.

As regard to the prevalence of depression among epileptic children in this study, there were nine cases (18%) of the 50 children with epilepsy aged 7–10 years having the score of mild depression on CDI scale, while six children (12%) of the matched control group had mild depression. Although there was a higher prevalence of depression among the epileptic children compared with the control group, there was no statistically significant relationship between the prevalence of depression and epilepsy. These results were consistent with Turkish study conducted by Bilgic *et al.* (2006); the study assessed the prevalence of depression among 30 patients between the ages of 8–16 years with primary idiopathic epilepsy, using CDI scores. The level of depressive symptoms was higher in the epileptic group than in the control group but not statistically significant.

However in contrast to this study, Jones *et al.* (2007) in 2007 studied children aged 8–18 years with recent onset epilepsy (<1 year in duration) of idiopathic etiology (n = 53) and a healthy comparison group (n = 50) and showed significantly higher rates of depressive disorders (22.6 vs. 4%, $P < 0.01$) compared with the comparison group using 4th ed. DSM-IV Axis I disorders. Similarly Baki *et al.* (2004) in 2004 studied 35 children and adolescents with seizures (age range = 7–19 years), 35 sex-matched healthy controls (age range = 8–17 years), in a cross-sectional analysis. Patients with epilepsy had higher CDI scores (mean ± SD = 12.48 ± 6.35) than controls (9.31 ± 5.11) ($P < 0.05$).

The variations between these results and the results of the other studies could be explained by a number of factors, which may affect the prevalence of depression. First: the age of epileptic children in the current study was 7–10 years to exclude the effect of puberty, whereas the other studies have included both children and adolescents in their subjects. Supporting this explanation, Oguz *et al.* (2002) noted more symptoms of depression in adolescents (12–18 years of age) with epilepsy as compared with children 9–11 years of age. The study applied CDI to 35 patients with epilepsy aged 9–18 years and to 35 healthy children who served as the control group. Both study and control groups were divided into two age groups: 9–11 years and 12–18 years. Depression scores (16.65 ± 8.32 and 8.15 ± 3.15, $P < 0.05$) were significantly higher in the 12–18 year age group of epileptic children than in the control group. Thome-Souza *et al.* (2004) also found a predominance of depression in adolescents and found that age was an important predictive factor. Second: prevalence of depression can vary due to the use of different ratings and diagnostic instruments and scales. Third: most of epileptic children in this study were on classic AEDs, 28% of them were on carbamazepine. Affective problems are rare complications of treatment with carbamazepine due to the antidepressant properties of it, which is chemically related to the tricyclic antidepressants (Schmitz, 2006).

As regard to the sex difference among the epileptic children with depression, in our study, we found that 66% of the epileptic children with depression were males, whereas 33% were females. Similarly 63% of

the epileptic children with no depression were males and 36% were females. We concluded that most of our sample group of epileptic children and control children were males and there was no significant relationship between sex and depression among epileptic children.

Consistent with our result, Hoare and Kerley (1991) and Baki *et al.* (2004) found no relationship between sex and depression in children and adolescents with epilepsy. However, Bilgic *et al.* (2006) found adolescent boys to have more emotional problems and suggested that, in epilepsy, male sex may be a risk factor for emotional symptoms. Stores (1978) suggested a higher rate of depressive complaints in boys. Although the underlying reason for this is unknown, he proposed that it may be related to higher expectations from men in society, which in turn, may cause more stigmatization.

As regard to the relationship between the prevalence of depression and age of onset of seizures, this study showed no significant relationship, as the mean age of onset of seizures among children with depression was 3.22 years which was not significantly different from the mean age of onset of epileptic children with no depression (3.19 years).

Consistent with these findings, Austin *et al.* (2001, 2002), Oguz *et al.* (2002), Baki *et al.* (2004), and Thome-Souza *et al.* (2004) did not support early onset seizures as being a risk factor for depression. However, a study conducted by Bromfield *et al.* (1992) on school placement suggested that depression and anxiety problems may be more common in children with a later age of onset of epilepsy.

One possible explanation of these results is that, the mean age of onset of seizures among epileptic children in the current study was 3 years and it is assumed that younger children are less aware of their disorder and, thus, less affected. Previous studies have suggested that children with seizure onset after 5 years of age typically display behavioral problems more often than cognitive deficits (Hermann *et al.*, 1980; Sabbagh *et al.*, 2006), whereas early age at onset of epilepsy is known to be associated with poor cognitive outcome (Meador *et al.*, 2001; Elger *et al.*, 2004).

Investigations on the relationship between seizure type and depression in the current study as a possible risk factor have shown that most of the cases (89%) of epileptic children with focal seizures had depression compared with 5% with no depression. So significant relationship between depression and focal seizures ($P < 0.001$) was found. Consistent with these results, Caplan *et al.* (2005) used mood self-report scales for 100 children with complex partial seizures (CPSs), 71 children with childhood absence epilepsy, and 93 normal children, aged 5–16 years. They reported significantly higher rates of depression in children with CPS as compared with children with childhood absence epilepsy. Thome-Souza *et al.* (2004) demonstrated that, in comparison with generalized seizures, focal seizures are associated with a higher risk of psychopathology in children. On the basis of the electroencephalographic findings of the epileptic children with focal seizures in the current study, there were four cases with frontal lobe localization and three cases of epileptic foci in the temporal lobe. The high prevalence of depression among patients with frontal lobe epilepsy has been explained by a bulk of evidence based studies by many authors; using PET and single-photon emission computed tomographic scans. They suggested that the hippocampus belongs to the limbic–frontal–subcortical network involved in the pathophysiology of major depressive disorder. Indeed, decreased hippocampal volume, blood flow and glucose metabolism were reported by Bremner *et al.* (2000) and Kennedy *et al.* (2001) in patients with major depressive disorder. Therefore, it is not surprising that seizure disorders of frontal lobe origin may also be associated with mood-altering symptoms (Sheline *et al.*, 1999, 2003).

Brain and brainstem changes of serotoninergic 5-hydroxytryptophan $(5\text{-HT})_{1A}$ receptor density have been reported in patients with major depressive disorder as well as in patients with TLE using PET and the selective antagonist radiotracers. These changes (combination of decreased extracellular concentration of 5-HT and number of 5-HT_{1A} receptors) in the most depressed patients would be consistent with the relationship between TLE and depression (Toczek *et al.*, 2003; Savic *et al.*, 2004).

In contrast to these results, Dunn *et al.* (1999) Oguz *et al.* (2002), and Baki *et al.* (2004) are not supporting a significant relationship between seizure type and depression in the study group of children with epilepsy. Ott *et al.* (2001) examined psychopathology in 48 children with CPSs, 39 children with primary generalized epilepsy with absence, and 59 nonepileptic children, aged 5–16 years. They found no difference in rates of depression between the two groups on the Schedule for Affective Disorders and Schizophrenia for School-Age Children.

Frequency and/or recurrence of seizures is another proposed risk factor for depression in children with epilepsy. There were 78% of epileptic children with mild depression having uncontrolled seizures and 22% of them had controlled seizures. While among epileptic children with no depression, there were 20 cases (49%)

with uncontrolled seizures. No significant relationship between frequency of seizures and the prevalence of depression in epileptic children in this study could be detected.

Consistent with this study, Thome-Souza *et al.* (2004), Caplan *et al.*, Schmitz (2006), Baki *et al.* (2004), and Bilgic *et al.* (2006) found no association between seizure frequency and the risk for general psychopathology and affective disorders. These findings are supported by a review of the literature (Plioplys *et al.*, 2007) that suggested psychopathology and emotional problems cannot be independently predicted by seizure frequency.

However in contrast to the findings of this study, Turky *et al.* (2008) showed that seizure frequency was significantly associated with emotional problems and depression. Austin *et al.* (2002) found a significant relationship between frequent seizures and internalizing problems and depression in children. Explanation for these findings included the possibility that both seizures and emotional problems are caused by an underlying neurological disorder, that is, seizure *per se* does not disrupt behavior and emotions.

The findings of this study can be explained by the younger age group of epileptic children in the current study compared with the adolescents included in the previously mentioned studies. We believe that the older the child, the greater is the child's perception of the changes in his or her daily life induced by the recurrence of seizures and the difference from peers. As regard to the potential risk of emotional side effects of treatment regimens, the current study showed no relationship between polytherapy and the prevalence of depression. It was found that 77% of epileptic children with depression were on polytherapy, whereas 80% of the epileptic children with no depression were on polytherapy.

Consistent with these results, Austin *et al.* (2002), Thome-Souza *et al.* (2004), and Caplan *et al.* (2005) have offered equivocal results, suggesting no significant difference in rates of depression between children on monotherapy and those on polytherapy. However, in contrast, Sabbagh *et al.* (2006) found a significant relationship between polytherapy and behavior problems in school-aged children with epilepsy. Hermann *et al.* (2000) also described behavior problems in patients on polytherapy, and Oguz *et al.* (2002) found that polytherapy was a significant predictor for the presence of depression in both children and adolescents with epilepsy.

It is hypothesized that antiepilepsy medication may have an effect on rates of psychiatric symptoms in epileptic patients. However in the current study, the majority of the cases with depression and anxiety were on classic antiepileptic medication mostly sodium valproate (77–80%) and carbamazepine (33–34%). There was no significant relationship between AEDs and depression in epileptic children in our study.

Consistent with this study, Dunn *et al.* (1999), Kessler *et al.* (2001), Oguz *et al.* (2002), Williams *et al.* (2003), Caplan *et al.* (2005), Alwash *et al.*, and Austin *et al.* (1992) reported that, AEDs have not been found to be consistent predictors of mood problems and depression. However, depression and increased suicidality have been associated with the use of phenobarbital in children with epilepsy. Newer AEDs, such as levetiracetam and topiramate have been found to increase the risk of depressive symptoms in patients with epilepsy (Jones *et al.*, 2007). However, this could not be revised in the current study due to economic reasons as most of the epileptic children received their medications from health insurance institutions where classic AEDs are used commonly, whereas the new AEDs used by the cases are usually expensive and not frequently used by our study group. So there was no significant number of cases on new AEDs to compare with.

Familial factors have also been found to be an important predictive factor for depression. This could not be supported by the current study, as no significant relationship between depression and family history of psychiatric and mental disorders was found. In contrast to this study, it has been well documented that depression is a familial illness (Mitchell *et al.*, 1989), and children of parents with depression are up to eight times more likely to develop depression than children of parents without depression (Wickramaratne and Weissman, 1998). This relationship appears to hold true for patients with epilepsy as well. Plioplys (2003) found that, family history of depression has been reported in up to 50% of patients with epilepsy and depression. However, the low prevalence of psychiatric disorders among the families of the epileptic children in this study could be due to cultural beliefs that ignore or deny the diagnosis of psychiatric troubles.

It is found that prevalence of poor school performance is significantly higher in epileptic children compared with matched siblings and control group (P = 0.004). Also significant relationship between poor school performance and depression among epileptic children was found (P = 0.025). Certainly, it is reasonable to expect that academic underachievement is likely to increase the probability of emotional distress in children and adolescents who suffer from cognitive difficulties. This is illustrated well in a study completed by Caplan *et al.* (2005) who found higher rates of

affective disorders in children with epilepsy who had lower verbal abilities. Such cognitive inefficiencies can interfere with the child's ability to perform, thus increasing the chances of severe frustration and anxiety. It has been also shown that, early age of onset of epilepsy (the mean age was 3 years in our study) is known to be associated with poor cognitive outcome (Meador *et al.*, 2001; Elger *et al.*, 2004), another recent study suggested that antiepileptic drugs also can induce clinically meaningful adverse cognitive and behavioral side effects (Bromley *et al.*, 2011).

Conflicts of interest

None declared.

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