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Anxiety and depression in children with epilepsy and their mothers

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Abstract

Objective. Children with epilepsy have high rates of depression and anxiety. The majority of studies concentrate on the children with epilepsy, but the emotional impact of epilepsy on family members is of clinical concern. In this cross-sectional study we aimed to examine the association between epilepsy in childhood and adolescence, and anxiety and depression in these patients and their mothers.

Methods. We studied 35 children and adolescents with seizures (age range, 7–19 years), 35 gender-matched healthy controls (age range, 8–17) who did not have any chronic medical illness, and mothers of these individuals ($n = 70$) in a cross-sectional analysis. We administered the Kovac Child Depression Inventory (CDI) and State–Trait Anxiety Inventory for Children (STAIc) to the children. We administered the Beck Depression Inventory (BDI) and State–Trait Anxiety Inventory (STAI) to the mothers of these children. Pearson correlations were used to analyze dependence between variables, and Student's t test was used to compare mean values between test scores.

Results. Patients with epilepsy had higher CDI scores (mean ± SD, 12.48 ± 6.35) than controls (9.31 ± 5.11) ($P < 0.05$), whereas the STAIc scores did not differ between cases (34.03 ± 8.29) and controls (35.20 ± 6.23) ($P < 0.05$). Mothers of children with epilepsy did not have more depression or anxiety symptoms than mothers of children without epilepsy as measured by BDI and STAI scores ($P > 0.05$). There was no correlation between mothers' scores and patients' or controls' scores.

Conclusions. These results support findings from previous studies that children and adolescents with epilepsy have a higher frequency of depressive but not anxiety symptoms than the general population of healthy children and that this is independent of their mothers' symptoms.
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Keywords: Anxiety; Depression; Epilepsy; Childhood; Psychopathology

1. Introduction

Epilepsy is a chronic disease that affects the behavioral and cognitive functioning of children [1]. The unpredictable nature and course of epilepsy may have a significant impact on both the physical and psychosocial functioning of the child and the family [2–5].

Prevalence of depression is increased in adults with epilepsy, ranging from 34 to 78% [11–14]. One study did not find an increased risk [15]. Children and adolescents with epilepsy also are at increased risk for depression, as documented in a number of previous studies [6–10]. In the general population, the rates of prevalence of depression in children and adolescents range from 2 to 9% [16–18]. The rate of depression in children and adolescents with chronic epilepsy as measured by self-reporting instruments varies between 23 and 26% [2,3].

An understanding of childhood depression requires evaluation of the relationships between biological, social, and iatrogenic risk factors and negative life events. Most of the biological explanations for depression in the population with epilepsy have focused on seizure type and lateralization of epileptic foci. In the majority of studies, electroencephalographic findings and age of onset have not been associated with depression in children [7,8], but seizure recurrence, high frequency, and longer duration of epilepsy have been found to be associated with depression [7,9].

In the general population, the rates of prevalence of anxiety disorders are 9.1% in men and 18.1% in women [19]. The prevalence of both anxiety and depression increases with age. Prevalence rates for anxiety disorders in adults with epilepsy range from 14 to 78% [19–21]. However, few studies have examined anxiety in children with epilepsy and the prevalence remains unknown [7,22,23]. In adult patients with epilepsy, many risk factors predisposing to the development of anxiety, including neurological, pharmacological, and psychosocial factors, have been identified [24]. Among the neurological factors, severity of epilepsy has been associated with increased anxiety; however, other disease-related factors have not been shown to be predictive of anxiety in children with epilepsy [22]. Among the psychosocial factors, unpredictability of seizures, fear of death, parental reactions of distress and fear, restrictions on normal living and activities, stigmatization and social rejection, misinformation about the disorder, and resulting low self-esteem may predispose children and adolescents to anxiety and negative affective responses [25]. Antiepileptic drugs (AEDs) can also contribute to the development of anxiety or depression, either as a side effect or because of withdrawal [23].

The emotional impact of epilepsy on family members is a neglected topic, with the majority of studies confined to patients with epilepsy. Frequent seizures and accompanying injuries may lead to considerable emotional strain for family members, especially parents [26]. Furthermore, parental beliefs and attitudes concerning epilepsy may significantly impact adjustment for both the child and family. A negative social attitude toward disability has been reported to affect the adjustment of parents of children and adolescents with epilepsy, and parental adjustment has been reported to be inversely associated with the severity of the child's epilepsy [27].

Ju et al. [28] reported that parents of children and adolescents with epilepsy have negative attitudes toward their children and have difficulties in their psychosocial adjustment probably because of social stigmata and misunderstanding of the illness. Pal and Chaudhury found that a significant proportion of parents adjusted poorly to their children with epilepsy in rural India. They hypothesized that in developing countries, parental adjustment is an important problem in epileptic children because of negative attitudes toward disability [29,30]. Several studies now suggest that social support is an important influence on adjustment in parents of children with disabilities [31]. Trute and Hauch [32] showed that the parents who adapted well to the birth of a disabled child had good social support networks and came from strong, well-organized families.

The relationship between parental anxiety and quality of life of children with epilepsy is not clearly understood. Parental anxiety, which may result in restriction of activities, has been reported to be associated with decreased quality of life for both the child and family [27]. Previous findings suggest that parental anxiety may have an impact on parenting behaviors. Highly anxious parents may be more likely to perceive higher risks for their children and misinterpret information about their child's condition. Transmission of parental anxiety to the child concerning health status is hypothesized to be a psychological risk for the child [33]. Whether behavioral changes associated with parental anxiety interfere with the process of parent–child separation and independence is unknown. Williams et al. [27] studied the anxiety and quality of life of parents of children with epilepsy. The mean level of parental anxiety was 38.58, which falls within the normal range. Their study suggests that families most vulnerable to reduced quality of life are those in which a child has poorly controlled epilepsy and increased parental anxiety [27].

The purpose of the present study was to examine the association between anxiety and depression in children and adolescents with epilepsy and anxiety and depression in their mothers, and to determine factors that may be predictive of their presence, in a hospital-based cross-sectional study of a Turkish clinical sample.

2. Methods

2.1. Patients and controls

The study included 35 children and adolescents with epilepsy (age range, 7–19) and their mothers who were seen in the Department of Neurology, Cerrahpasa School of Medicine, Istanbul, Turkey. Patients had been diagnosed with epilepsy for at least 1 year. Table 1 summarizes the demographic and clinical aspects of the patients included in the study.

The control group consisted of 35 healthy age- (age range, 8–17) and gender-matched children and adolescents recruited from two local high schools and their mothers. We screened children of the control group for a psychiatric, linguistic, or hearing disorder through interview and excluded those with a neurological disorder, previously diagnosed psychiatric disorder, hearing impairment, or lack of native fluency in Turkish. Writ-

Table 1
Demographic and clinical features of the study population

	Patients	Controls
n	35	35
Female/male	15/20	15/20
Age (mean ± SD)	12.8 ± 3.6	12.7 ± 2.8
Age at onset of seizures (mean ± SD)	8.7 ± 4.2	—
Disease duration (mean ± SD)	4.2 ± 3.2	—
Simple partial seizures	16 (45.7%)	—
Complex partial seizures	10 (28.6%)	—
Generalized seizures	9 (25.7%)	—
Lesion on MRI	11 (31%)	—
Mother's age (mean ± SD)	37.6 ± 6.6	38.6 ± 5.1
Mother's education		
Primary school only	5 (14.3%)	3 (8.6%)
High school	22 (62.9%)	20 (57.1%)
College or higher	8 (22.9%)	8 (22.9%)[a]
Socioeconomic status		
Low income	10 (28.6%)	13 (37.1%)
Middle income	16 (45.7%)	16 (45.7%)
High income	9 (25.7%)	3 (8.6%)[b]

[a] In mothers of 4 children the education level information was not available.

[b] In 3 children socieconomic status information was not available.

ten consent for participation in the study was obtained from the mothers of all the children. At the time of neurological assessment, demographic and seizure-related data were collected, as were data concerning comorbid learning, emotional, or behavioral disorders in the patients with epilepsy. Certain demographic data, such as family's economic status and mother's educational level, were preclassified per mother's own report. As control individuals were selected from a generally middle class school district, this information could be important to correct for in our final analyses. Economic status was classified as 1 = low, 2 = middle, or 3 = high, and highest education level completed by the mother was classified as none, primary, middle, or high level based on the educational system hierarchy of Turkey.

2.2. Psychological evaluation

All patients and control subjects underwent extensive baseline neuropsychological examinations that included measures of general intelligence (Cattel intelligence test, IQ) and visuomotor integration (Bender Visual Motor Gestalt Test). Patients who did not have the intelligence to complete the questionnaires were excluded from the study.

The parents were administered two questionnaires including the Beck Depression Inventory (BDI) [34,35] and the State–Trait Anxiety Inventory for Adults (STAI) [36]. The children and adolescents were administered two questionnaires including the Kovac Children's Depression Inventory (CDI) [37] and the State–Trait Anxiety Inventory for Children (STAIc) [36].

The BDI is a 21-item scale assessing the symptoms and experience of depression, and is scored by summing the responses. Each of the 21 items in this scale includes four different aspects to better reflect the patient's mood in the preceding week. Mild depression is detected by a score of 11–17, moderate depression by a score of 18–23, and severe depression by a score of 24 or higher. This test was developed by Beck and associates in 1961 and then revised by Beck in 1979 [34]. The 1979 version of the BDI was adapted to Turkish by Hisli in 1988 [35].

STAI and STAIc [36] have been used extensively in research with both adults and adolescents. STAI is a 20-item self-report rating scale for measuring state and trait anxiety. The State Anxiety scale requires people to describe how they feel right now, and increases in response to situational stress and declines under relaxed conditions. The Trait Anxiety scale asks people to describe how they generally feel, and reflects relatively stable individual differences in anxiety proneness that are impervious to situational stress. The items are rated on a scale of 1–4. Total scores range from 20 to 80. The mean score (±SD) for working adult men is 34.89 ± 9.2, and that for working adult women, 34.79 ± 9.2. The STAI has high internal consistency and high test–retest reliability. In this study the Trait Anxiety scale was used [36].

CDI is a self-report 27-item scale designed for school-aged children and adolescents. It quantifies a range of depressive symptoms including disturbed mood, hedonic capacity, vegetative functions, self-evaluation, and interpersonal behaviors. Total score ranges from 0 to 54 [38]. Although originally tested on 8–13 year-olds, the current version of the CDI has been validated with a large population of 10–17 year-olds. The cutoff scores of 13–19 are suggested as a screening tool for detecting depressive disorders in children and adolescents [37–39].

2.3. Statistical analysis

Results were analyzed using the Statistical Package for the Social Sciences for Windows (SPSS PC-). An initial correlation analysis was performed using Pearson's *r* test to delineate interactions between the demographic and clinical variables and psychological test scores. Student's *t* test was used to determine whether there were differences in depression scores between patients and controls and between mothers of patients and mothers of controls. χ^2 analysis was performed to test the significance of effects of binary variables. Significance was set at a *P* value of 0.05.

3. Results

Demographic and clinical features of the patient and control populations are summarized in Table 1. Two pa-

tients and their mothers were excluded from the analysis as they were not able to complete the CDI and STAIc. There was no difference between the ages of cases and controls ($P > 0.05$).

All variables that could potentially impact dependent outcome measures of the BDI, CDI, STAI, and STAIc were independently analyzed to identify factors that may need to be corrected for in the final analysis of disease status with the psychometric test scores. These factors were mother's age, mother's education, socioeconomic status of the family, age of child, gender of child, IQ, and Bender Gestalt test results. This was initially done with a correlation analysis without any attention to significance (data not shown). Based on the possible correlations observed, we analyzed economic status and mother's educational level in relation to disease status. Even using a liberal uncorrected χ^2 analysis, we detected no difference between cases and controls with respect to economic status ($P = 0.091$) and mother's educational level ($P > 0.05$).

Patients with epilepsy had a higher prevalence of symptoms of depression compared with the control group. Mean depression scores on the CDI were higher in patients with epilepsy (12.48 ± 6.35) compared with controls (9.31 ± 5.11) ($P = 0.026$) (Fig. 1).

Age of child or gender did not show any correlation with CDI and STAIc scores (correlation coefficient <0.25). BDI scores were directly proportional to CDI scores ($R = 0.31$ cases, $R = 0.32$ controls), and CDI scores were directly proportional to STAIc scores ($R = 0.12$ cases, $R = 0.26$ controls), although these correlations were not strong.

There was no difference in mean BDI scores between patients' and controls' mothers (Fig. 1). Depression was present in 16 (48.5%) of the patients' mothers and 18 (41.4%) of the controls' mothers. Moderate to severe depression was present in 11 (33.3%) of the patients' mothers and 10 (28.6%) of the controls' mothers, reflecting the presence of depression in the mothers independent of the disease status of the child. There was no correlation between the mother and child depression

scores, suggesting that the child's depression was likely due to disease status.

As shown in Fig. 1, disease status did not affect any of the anxiety scores in children and adolescents and their mothers when the mean scores were considered. Mean ($\pm$SD) STAIc scores were 34.03 ± 8.29 in patients and 35.20 ± 5.59 in control children ($P > 0.05$). Mean ($\pm$ SD) STAI scores were 35.94 ± 8.81 in patients' mothers and 36.77 ± 11.74 in controls' mothers ($P > 0.05$). However, 16 of 33 patients (49%) and 17 of 35 healthy controls (49%) had anxiety scores higher than the previously determined STAIc threshold score of 35, "abnormal level of anxiety" ($P > 0.05$). Similarly, 15 of 33 mothers of patients (45%) and 15 of 35 mothers of controls (43%) had anxiety scores higher than the previously determined threshold score of 35, reflecting increased levels of anxiety independent of disease status in both children and their mothers. There was no correlation between mother and child STAI scores (data not shown).

4. Discussion

In this study, we have prospectively investigated the relationship between epilepsy and depression and anxiety symptoms in children and adolescents with epilepsy and age- and gender-matched healthy controls, as well as mothers of these children, using self report scales.

4.1. Depression in children and adolescents with epilepsy and control children

In this study, 12% of children with epilepsy and 9% of control subjects had high depression scores on the CDI. Our finding of higher depression scores on the CDI is consistent with prior reports of depression in children and adolescents with epilepsy [5–7,40,41]. The general population prevalence of depression in children and adolescents is 2–9% [42,43]. Consistent with these findings, Alwash et al. [40] found depression in 33% of children and adolescents with seizures compared with 16% of controls. Oguz et al. [7] also noted more symptoms of depression in adolescents 12–18 years of age with epilepsy when compared with children 9–11 years of age with seizures or when compared with healthy controls. However, we did not detect such a difference between age groups in our study.

Among the epilepsy-related factors, seizure type, age at seizure onset, seizure frequency, and longer duration of epilepsy were not associated with depression in this study group of children with epilepsy. The finding that age at seizure onset is not associated with depression is consistent with the literature [7,44]. In agreement with our findings, seizure type or syndrome was not correlated with behavioral problems in other studies [7,45–48].
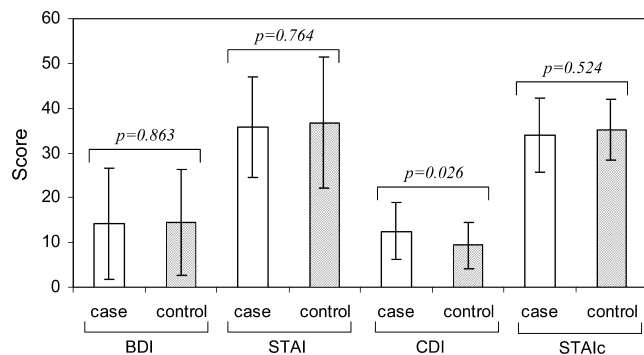

Fig. 1. Mean test scores in cases and controls. Bars represent standard deviations. P values for Student's t test are given.

In contrast with our study an association between frequent poorly controlled seizures, longer duration of epilepsy, and emotional problems has been seen repeatedly in studies of children and adolescents with epilepsy [7,45,46]. In our study it is possible that the sample size was too small to detect a difference or the regular follow-up in a well organized epilepsy clinic may have provided preventive emotional support.

Although it has been suggested that adolescent girls experience more depressive symptoms than adolescent boys or younger children in the general population, this association has been inconsistent in children or adolescents with epilepsy [15–17]. Stores et al. indicated boys had more problems whereas Austin et al. reported more problems in girls [48,49]. We did not find a correlation between gender and depression in children and adolescents with epilepsy, which is consistent with the findings of Hoare and Kerley [5].

4.2. Anxiety in children and adolescents with epilepsy and control groups

We found that the majority (51%) of children and adolescents with treated epilepsy had anxiety scores within the normal range and 49% of the epilepsy patients had mild to moderate symptoms of anxiety. However, mean STAIc scores of patients and control children did not differ. In contrast to our finding, Oguz et al. [7], using the STAI in 35 children and adolescents with epilepsy and 35 healthy control children, found that the mean trait anxiety score was significantly higher in children with epilepsy compared with healthy controls. Similarly, Margalit and Heiman [50] used the STAI to examine anxiety in children with epilepsy, children with learning disabilities, and healthy controls between the ages of 8 and 14. The levels of trait anxiety in children with epilepsy did not differ from those of children with learning disabilities; however, they were found to have significantly higher levels of trait anxiety than normal controls. Alwash et al. [40] used the DSM-IV criteria in their study to assess anxiety symptoms; they reported that children and adolescents with epilepsy (48.5%) have a significantly higher tendency to develop symptoms of anxiety when compared with healthy controls (16.8%). Ettinger et al. [6] and Williams et al. [22] showed that children and adolescents with epilepsy had more anxiety compared with the healthy children when measured with the Revised Children's Manifest Anxiety Scale (16 and 23%, respectively).

The number of studies that have examined anxiety in children with epilepsy is small, and the prevalence remains unknown. Although most studies suggest an association between presence of epilepsy and anxiety in children, Lewis et al. [51] did not find a difference in the rates of emotional and behavioral disturbances between patients with epilepsy and controls in children

and adolescents aged 8–22 years, using the Developmental Behavior Checklist.

Consistent with our findings, gender, age, age of seizure onset, and seizure type were not associated with anxiety in other studies [6,7,22]. In contrast, Oguz et al. [7] found that higher seizure frequency was associated with increased anxiety in young or old children, and longer duration of epilepsy was associated with increased anxiety only in the older group. Some studies have suggested that higher seizure frequency or epilepsy duration is associated with increased anxiety [7,40]; however Ettinger et al. [6] did not find a significant correlation between number of seizures or duration of seizures and anxiety scores, which is in agreement with our findings.

4.3. Depression in mothers

Previous studies found an increase in psychological problems for mothers and siblings of children with chronic epilepsy beyond that seen in families of children with new-onset seizures, suggesting that the continuing presence of epilepsy has a negative impact on family functioning [26,52]. In our study, mothers of children with epilepsy were no more impaired than mothers of healthy children.

4.4. Anxiety in mothers

We did not detect a difference in anxiety level between mothers of children with epilepsy and mothers of children without epilepsy. Consistent with our findings, Williams et al. [27] reported that the mean level of parental anxiety was within the normal range and did not differ by seizure type.

Differences between our results and other studies overall may be based on the scales used. Alternatively, the differences may be related to the different social and medical support systems that are in place in different study populations. Trute and Hauch showed that parents who adjusted well to the presence of a disabled child used social support networks extensively and came from strong, well-organized families [32]. It is possible that the extended and generally strong intrafamily support in the Turkish family structure may play a role in our findings. Formal social support is difficult to find for parents in developing countries, because of the paucity of trained professionals. We therefore suggest that if parental adjustment can be promoted by members of the family and community, patients and their families may not require more intervention by professionals.

There are several limitations to our results. The study's findings should be interpreted with caution before replication on larger groups of children, because the sample size was small and the group of children with epilepsy was heterogeneous especially with respect to

seizure-related variables. Given that our patient population was referral based, these conclusions cannot be extended to the general population with epilepsy living in the community. However, as milder disease varieties can be expected among those not seen in epilepsy centers, we do not expect increased emotional disturbances among patients in the general population. Furthermore, this is a cross-sectional study, preventing an analysis of cause and effect. The CDI is probably the most widely used childhood depression rating instrument, but it has limitations [53]. As the CDI focuses on the subject's report, it seemed crucial to obtain independent data from a skilled observer. Although we have exclusively interviewed mothers for this study because they are the main caregivers, we do not deny the importance of adjustment in fathers and other family members.

Another problem with studies such as ours is that antiepileptic medications also have mood-stabilizing properties. Antiepileptic medications may affect the cognitive, behavioral, and emotional state of the epileptic patient negatively or positively [23,54]. The present study did not attempt to investigate the relationship between specific medications or doses of medication and depression and anxiety.

5. Conclusion

We conclude that: (1) The prevalence of symptoms of depression is increased in patients with epilepsy, consistent with previous studies on children and adolescents with epilepsy. (2) The prevalence of symptoms of anxiety is increased in patients with epilepsy compared with previous general population studies; however, this study did not find significant differences between the group of children and adolescents with epilepsy and the control group. (3) The prevalence of symptoms of depression and anxiety is increased in mothers of patients with epilepsy compared with previous general population studies; however, this study also did not find significant differences between mothers of children and adolescents with epilepsy and mothers of controls. (4) Seizure type, age at seizure onset, seizure frequency, and longer duration of epilepsy have not been associated with depression and anxiety in this study group of children with epilepsy.

Although anxiety and depression symptoms are frequently seen in children and adolescents with epilepsy, they are underrecognized and undertreated. It is essential that children and parents receive education about depression and anxiety disorders. Increased awareness of the clinical presentations of anxiety and depressive disorders may help clinicians to develop effective prevention and intervention strategies to improve the long-term outcome.

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