

Psychiatric comorbidity distribution and diversities in children and adolescents with attention deficit/hyperactivity disorder: a study from Turkey

Murat Yüce¹
 Süleyman Salih Zoroglu²
 Mehmet Fatih Ceylan³
 Hasan Kandemir⁴
 Koray Karabekiroglu⁵

¹Department of Child and Adolescent Psychiatry, Faculty of Medicine, Ondokuz Mayıs University, Samsun, Turkey; ²Department of Child and Adolescent Psychiatry, Medical Faculty of Istanbul, Istanbul University, Istanbul, Turkey; ³Department of Child and Adolescent Psychiatry, Dr Sami Ulus Children's Hospital, Ankara, Turkey; ⁴Department of Child and Adolescent Psychiatry, Faculty of Medicine, Harran University, Sanliurfa, Turkey; ⁵Department of Child and Adolescent Psychiatry, Faculty of Medicine, Ondokuz Mayıs University, Samsun, Turkey

Objective: We aimed to determine distribution and diversities of psychiatric comorbidities in children and adolescents with attention deficit/hyperactivity disorder (ADHD) in terms of age groups, sex, and ADHD subtype.

Materials and methods: The sample included 6–18 year old children and adolescents from Turkey (N=108; 83 boys, 25 girls) diagnosed with ADHD. All comorbid diagnoses were determined based on the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version assessment.

Results: 96.3% of the cases were found to have at least one psychiatric comorbid diagnosis. The most frequent psychiatric comorbid disorder was oppositional defiant disorder (69.4%) followed by anxiety disorders (49%) and elimination disorders (27.8%). Disruptive behavior disorders were more common in ADHD-combined type. Depression and anxiety disorders were more common in girls. Separation anxiety disorder and elimination disorder were more common in children, whereas depression, bipolar disorder, obsessive-compulsive disorder, and social phobia were more common in the adolescents.

Conclusion: According to our results, when a diagnostic tool was used to assess the presence of comorbid psychiatric disorders in children and adolescents diagnosed with ADHD, almost all cases had at least one comorbid diagnosis. Therefore, especially in the clinical sample, ADHD cases should not be solely interpreted with ADHD symptom domains, instead they should be investigated properly in terms of accompanying psychiatric disorders.

Keywords: attention deficit/hyperactivity disorder, psychiatric comorbidity, child, adolescent

Introduction

Attention deficit/hyperactivity disorder (ADHD) is one of the most frequent psychiatric disorders of childhood. ADHD, which is a multifactorial and clinically heterogeneous disease, leads to socioeconomic burden and undesirable academic and occupational results.^{1,2} Worldwide prevalence of ADHD has been reported to be 4%–7% in children.³ ADHD is most frequent among school-age children and its frequency decreases in further ages.^{4,5} Furthermore, most of the recent studies assume that ADHD is a life-long disorder.^{3,6–10}

ADHD is more common in boys as compared to girls. The boy to girl ratio varies from 3:1 to 10:1 depending on the study design; for instance, being a community or a clinical sample.¹

Correspondence: Murat Yüce
 Department of Child and Adolescent Psychiatry, Faculty of Medicine, Ondokuz Mayıs University, Samsun, Turkey
 Tel +90 505 823 0653
 Fax +90 362 457 6041
 Email muryuce@yahoo.com

Other psychiatric disorders and social problems are likely to accompany a substantial proportion of children admitted to a clinic with a diagnosis of ADHD, and this enhances the severity of the clinical picture.¹¹ The presence of psychiatric comorbidities complicates the diagnosis and treatment procedures, and interferes with the prognostic assumptions of ADHD. Therefore, evaluation and proper diagnosis of comorbid psychiatric disorders are of great importance.¹² Psychiatric disorders that accompany ADHD vary widely among different countries and cultures.^{13,14} There are a limited number of studies that have been performed in Turkey on this issue. A clinical-based study conducted in Turkey evaluated children with ADHD using The Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children–Present and Lifetime Version (K-SADS-PL) and found that 73.7% of the children had at least one comorbid psychiatric disorder.¹⁵

There are numerous population- and clinical-based studies reporting that more than half of ADHD cases have at least one psychiatric comorbidity and that this rate increases with age.^{16–18} A study conducted in Switzerland reported one comorbidity in 87% of ADHD cases and more than one comorbidity in 67%.¹⁸ A study from Iran detected at least one psychiatric comorbidity in 73% of child and adolescent cases of ADHD.¹⁹ It has also been reported that the clinical group (cases assessed in psychiatric outpatient clinics) has more comorbid psychiatric disorders compared to the general population.²⁰

Oppositional defiant disorder is characterized by a pattern of hostile, negativistic, defiant, and disobedient attitudes and behaviors, especially toward authority figures, that is associated with less social and academic functioning.²¹ Oppositional defiant disorder has been reported to be one of the most frequent comorbidities in ADHD with a rate reported between 20% and 80%.^{18,19,22–24} Conduct disorder is also one of the comorbidities of ADHD.^{25,26} Wilson and Marcotte divided ADHD cases aged between 14 and 18 years into two groups as having conduct disorder or not and compared them in terms of school success, self-perception, behavior problems, alcohol and substance abuse, and adaptive behaviors.²⁷ They reported that cases with conduct disorder displayed significantly lower school success, higher externalizing behaviors and emotional difficulties, and lower adaptive behaviors as compared to cases without conduct disorder.²⁷ The rate of depression and anxiety disorder concomitant with ADHD has been reported to be 20%–40%.²⁸ Concurrence of ADHD and bipolar disorder or confusing them with each other is an unclear issue. It has also been reported that some of the

children receiving ADHD treatment meet the diagnostic criteria of anxiety disorders.²⁹ Family studies have reported that ADHD is widespread among children, adolescents, and adults with bipolar disorder.^{25,30,31} Tics are sudden, repetitive movements, gestures, or phonic productions that typically mimic some aspect of normal behavior.³² The rate of tic disorder comorbidity has been reported to be between 4% and 18% in patients with ADHD.^{29,33} The disorders of elimination – enuresis and encopresis – represent an inability to achieve or maintain control of bodily functions.³⁴ Nocturnal enuresis is the intermittent involuntary loss of urine at night, in the absence of physical disease, at an age when a child could reasonably be expected to be dry (chronological age is at least 5 years).^{34–36} It is known that primary nocturnal enuresis is common in patients with ADHD.³⁷ Although the association between these two conditions has not been clearly defined, they have been considered to share a common genetic mechanism.³⁸ It has been reported that the frequency of primary nocturnal enuresis in patients with ADHD is 21%–32% and it is 1.8–6 times higher as compared to the general population.^{37,38}

In addition, the rate of comorbid diagnoses may vary according to the subtypes of ADHD, age groups, and sex. For instance, it has been reported that conduct disorder and oppositional defiant disorder appear in early childhood in ADHD, whereas depression and anxiety symptoms appear at older ages.¹¹ In another study, Lahey et al found the frequency of anxiety disorder to be higher in children with the ADHD-inattentive subtype as compared to the children with the ADHD-combined subtype.³⁹

In the present study, we aimed to determine frequency of psychiatric comorbidities in children and adolescents diagnosed with ADHD and to assess the association between age groups, sex, and ADHD subtype and the distribution of comorbid psychiatric disorders.

Materials and methods

Participants and process

The present study included children aged between 6 and 18 years, who were admitted to the pediatric psychiatry outpatient clinic of our hospital within a 4-month period and were diagnosed with ADHD according to the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (DSM-IV) criteria. All subjects in this study were treatment-naïve. The assessment was done in the first psychiatric admission. The K-SADS-PL was used to assess comorbid psychiatric disorders. Mental retardation was an exclusion criterion in our study.

Scales

The K-SADS-PL is a semi-structured interview scale, which is widely used and enables evaluation in 20 different diagnostic domains. Kaufman et al reported K-SADS-PL as a valid and reliable diagnostic tool.⁴⁰ Gökler et al adapted K-SADS-PL into Turkish in 2004.⁴¹ This scale was applied to all cases and their parents by the physician trained with “Structured Interview Techniques” in the K-SADS-PL.

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (IBM Corporation, Armonk, NY, USA) version 10.0. Descriptive statistics were expressed as mean, standard deviation, and percentage. Proportional comparisons were carried out using Pearson’s chi-square, Yates’ chi-square, and Fisher’s exact tests. For Fisher’s exact tests, as a chi-square value could not be calculated, only *P*-values are presented. Margin of error (alpha value) was considered 95%; thus, *P*-values < 0.05 were considered to be statistically significant.

Results

The mean age of all participants (*n*=108; 83 boys, 25 girls) was 10.26±3.3 (range: 6–18) years. Of the children, 64.8% (*n*=70) were in the 6–11 years age group and 35.2% (*n*=38) were in 12–18 years age group. Of the children, 86.1% were diagnosed with ADHD-combined type (ADHD-C) and 13.9% were diagnosed with ADHD-predominantly inattentive type (ADHD-PI). None of the children were diagnosed with ADHD-predominantly hyperactive-impulsive type (ADHD-HI). Age and sex distributions with respect to the diagnostic subtypes are summarized in Table 1. While the distribution of ADHD subtypes did not differ according to age, ADHD-PI type was found to be more common in the girls.

With regard to comorbidities, 104 children (96.3%) had a mental disorder other than ADHD. Of these children,

36 (33.3%) had one, 45 (41.7%) had two, eleven (10.2%) had three, four (3.7%) had four, six (5.6%) had five, and two (1.9%) had six psychiatric comorbidities. The most frequently observed comorbidity was oppositional defiant disorder with a rate of 69.4%. The rates of psychiatric comorbidities are presented in Figure 1.

Psychiatric comorbidities according to ADHD subtypes are demonstrated in Table 2. Disruptive behavior disorders were more frequent in children diagnosed with ADHD-C type, whereas anxiety disorders were more frequent in children diagnosed with ADHD-PI type.

In general, anxiety disorder was found to be more common in the girls. It was found that depressive disorders were more frequent in the girls as compared to the boys (Table 3).

Based on the assumption that the frequency of comorbidities might be different in children (<12 years) and adolescents (≥12 years), it was investigated with respect to age. Mood disorder was found in 1.4% of the children and 31.6% of the adolescents. Both depression and bipolar disorder were more frequent in the adolescents as compared to the children. Separation anxiety was significantly more common in the children; on the other hand, obsessive-compulsive disorder and social phobia were more common in the adolescents. Elimination disorder was found to be more frequent in the children as compared to the adolescents (Table 4).

Discussion

In this study, the rates of psychiatric comorbidities in children and adolescents with ADHD were investigated. It has been reported that ADHD is three to ten times higher in males depending on whether the study is population-based or clinical-based.¹ In the present clinical-based study, the male:female ratio was 3.3:1.0.

In a recent meta-analysis by Willcutt, studies on ADHD diagnosed according to DSM-IV were reviewed and it was revealed that ADHD-PI type was the most frequently observed type in the population; however, ADHD-C type was probably referred to the clinical services more frequently.⁴² In the present clinical-based study, ADHD-C type (86.1%) was the most common type and 13.9% of the cases were diagnosed with ADHD-PI type; however, none of the cases were diagnosed with ADHD-HI type. Similarly, Byun et al conducted a study using K-SADS-PL and detected ADHD-C type in 66.7%, ADHD-PI type in 21%, ADHD-HI type in 1%, and ADHD not otherwise specified in 11.4% of the patients.⁴³ Differently, Ghanizadeh reported ADHD-C type in 42.7%, ADHD-PI type in 26.3%, and ADHD-HI type in 31% of 171 children with ADHD.¹⁹ Another clinical-based

Table 1 Characteristics of cases according to the diagnosis

	ADHD-C type n (%)	ADHD-PI type n (%)	SD	χ^2	<i>P</i>
Sex					
Boys	77 (92.8)	6 (7.2)	1	11.001	0.001
Girls	16 (64.0)	9 (36.0)			
Age groups, year					
6–11 (child)	63 (90.0)	7 (10.0)	1	1.676	0.195
12–18 (adolescent)	30 (78.9)	8 (21.1)			

Abbreviations: ADHD-C, attention deficit/hyperactivity disorder-combined subtype; ADHD-PI, attention deficit/hyperactivity disorder-predominantly inattentive subtype; SD, standard deviation.

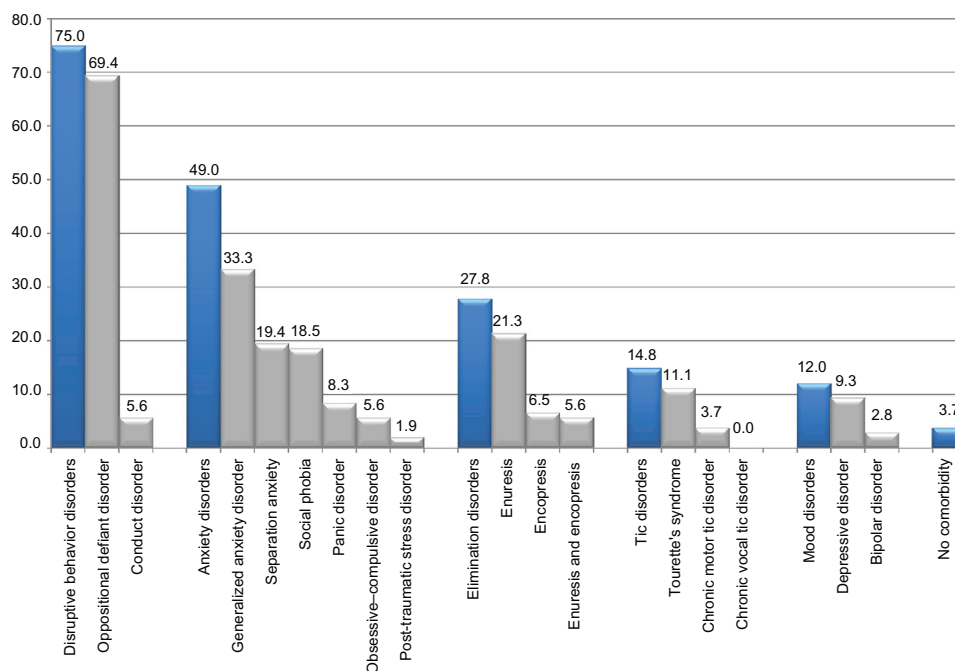


Figure 1 Distribution of psychiatric comorbidities in children with attention deficit/hyperactivity disorder.

study conducted in Turkey reported that the frequency of ADHD-C type was 60.9%, ADHD-PI type was 36.1%, and ADHD-HI type was 3%.¹⁵

In population-based samples, in patients with ADHD diagnosed according to DSM-IV, the male:female ratio was

reported to be 2.7:1.0 for ADHD-C type, 5.2:1.0 for ADHD-HI type, and 1.8:1.0 for ADHD-PI type.⁴² In the present study, when investigating the frequency of ADHD subtypes according to sex, ADHD-C type was the most frequently encountered subtype both in boys and girls (92.8% and 64%, respectively).

Table 2 Psychiatric comorbidities in cases with attention deficit/hyperactivity disorder according to diagnostic subtypes

	ADHD-C type (n=93) n (%)	ADHD-PI type (n=15) n (%)	SD	χ^2	P
Disruptive behavior disorder	77 (82.8)	4 (26.7)	1	18.811	0.000
Oppositional defiant disorder	71 (76.3)	4 (26.7)	1	12.777	0.000
Conduct disorder	6 (6.5)	0 (0.0)		–	0.593
Mood disorder	10 (10.8)	3 (20.0)		–	0.386
Depressive disorder	7 (7.5)	3 (20.0)			0.122
Bipolar disorder	3 (3.2)	0 (0.0)			1.000
Anxiety disorder	42 (45.2)	11 (73.0)	1	4.104	0.043
Separation anxiety disorder	18 (19.4)	3 (20.0)			1.000
Social phobia	11 (11.8)	9 (60.0)			0.000
Generalized anxiety disorder	31 (33.3)	5 (33.3)	1	0.000	1.000
Obsessive-compulsive disorder	4 (4.3)	2 (13.3)			0.194
Panic disorder	6 (6.5)	3 (20)			0.109
Post-traumatic stress disorder	2 (2.2)	0 (0.0)			1.000
Tic disorder	15 (16.1)	1 (6.7)			0.462
Chronic vocal tic disorder	0 (0.0)	0 (0.0)			NA
Chronic motor tic disorder	4 (4.3)	0 (0.0)			1.000
Tourette's disorder	11 (11.8)	1 (6.7)			1.000
Elimination disorder	26 (28.0)	4 (26.7)			1.000
Enuresis	21 (22.6)	2 (13.3)			0.518
Encopresis	0 (0.0)	1 (6.7)			0.140
Enuresis and encopresis	5 (5.4)	1 (6.7)			1.000

Abbreviations: ADHD-C, attention deficit/hyperactivity disorder-combined subtype; ADHD-PI, attention deficit/hyperactivity disorder-predominantly inattentive subtype; NA, not applicable, sample size too small to calculate P-value; SD, standard deviation.

Table 3 Psychiatric comorbidities in cases with attention deficit/hyperactivity disorder according to sex

	Girls (n=25) n (%)	Boys (n=83) n (%)	SD	χ^2	P
Disruptive behavior disorder	16 (64.0)	65 (78.3)		1.41	0.236
Oppositional defiant disorder	15 (60.0)	60 (72.3)		0.85	0.357
Conduct disorder	1 (4.0)	5 (6.0)			1.000
Mood disorder	5 (20.0)	8 (9.6)			0.174
Depressive disorder	5 (20.0)	5 (6.0)			0.049
Bipolar disorder	0	3 (3.6)			1.000
Anxiety disorder	17 (68.0)	36 (43.4)		4.662	0.031
Separation anxiety disorder	6 (24.0)	15 (18.1)		0.136	0.713
Social phobia	7 (28.0)	13 (15.7)			0.238
Generalized anxiety disorder	12 (48.0)	24 (28.9)		2.349	0.125
Obsessive–compulsive disorder	0	6 (7.2)			0.333
Panic disorder	3 (12.0)	6 (7.2)			0.429
Post-traumatic stress disorder	1 (4)	1 (1.2)			0.411
Tic disorder	0 (0.0)	16 (19.3)			0.002
Chronic vocal tic disorder	0 (0.0)	0 (0.0)			NA
Chronic motor tic disorder	0 (0.0)	4 (4.8)			0.571
Tourette's disorder	0 (0.0)	12 (14.5)			0.064
Elimination disorder	6 (24.0)	24 (28.9)		0.051	0.821
Enuresis	4 (16.0)	19 (22.9)		0.211	0.646
Encopresis	1 (4.0)	0 (0.0)			0.231
Enuresis and encopresis	1 (4.0)	5 (6.0)			1.000

Abbreviations: NA, not applicable, sample size too small to calculate P-value; SD, standard deviation.

ADHD-PI type was significantly more common in the girls than the boys (36% versus 7.2%, $P < 0.001$). Gaub and Carlson investigated differences between sexes and reported a lower level of attention in girls and more frequent aggressive behaviors in boys.⁴⁴ Ghanizadeh found no difference

between boys and girls in terms of the prevalences of ADHD subtypes.¹⁹ Rates may change depending on whether the study is population-based or clinical-based.

In our study, 104 (96.3%) of 108 patients had at least one psychiatric comorbidity. This ratio was similarly high in

Table 4 Psychiatric comorbidities in cases with attention deficit/hyperactivity disorder according to the age group

	Child (n=70) n (%)	Adolescent (n=38) n (%)	SD	χ^2	P
Disruptive behavior disorder	51 (72.9)	30 (78.9)		0.22	0.642
Oppositional defiant disorder	48 (68.6)	27 (71.1)		0.07	0.789
Conduct disorder	3 (4.3)	3 (7.9)			0.663
Mood disorder	1 (1.4)	12 (31.6)			0.000
Depressive disorder	1 (1.4)	9 (23.7)			0.000
Bipolar disorder	0 (0.0)	3 (7.9)			0.041
Anxiety disorder	30 (42.9)	23 (60.5)		2.41	0.121
Separation anxiety disorder	18 (25.7)	3 (7.9)		3.92	0.048
Social phobia	7 (10.0)	13 (34.2)		8.03	0.005
Generalized anxiety disorder	26 (37.1)	10 (26.3)		0.86	0.354
Obsessive–compulsive disorder	1 (1.4)	5 (13.2)			0.002
Panic disorder	4 (5.7)	5 (13.2)			0.253
Post-traumatic stress disorder	2 (2.9)	0 (0.0)			0.540
Tic disorder	9 (12.9)	7 (18.4)		0.247	0.622
Chronic vocal tic disorder	0 (0.0)	0 (0.0)			NA
Chronic motor tic disorder	3 (4.3)	1 (2.6)			1.000
Tourette's disorder	6 (8.6)	6 (15.8)			0.338
Elimination disorder	26 (37.1)	4 (10.5)		7.42	0.006
Enuresis	19 (27.1)	4 (10.5)		3.13	0.077
Encopresis	1 (1.4)	0 (0.0)			1.000
Enuresis and encopresis	6 (8.6)	0 (0.0)			0.088

Abbreviations: NA, not applicable, sample size too small to calculate P-value; SD, standard deviation.

the results of previous studies conducted using K-SADS-PL (70%–80%); however, in our study the comorbidity rate was unusually higher than those of the studies conducted using different scales.^{15,17,43,45–47} The high percentage of the presence of comorbid disorders can be associated with the study method. In other words, it can be assumed that various psychiatric disorders can be evaluated with K-SADS-PL in more detail. It has been also reported that the clinical group has more comorbidities as compared to the general population.²⁰ This may result from the fact that patients having more severe symptoms or more functional disorders are admitted to hospitals more frequently. The present study group included the patients admitted to the outpatient polyclinic of a university hospital. Another clinical-based study conducted in Turkey evaluated children with ADHD using K-SADS-PL and found that 73.7% had at least one psychiatric comorbidity.¹⁵ Biederman et al reported two or more comorbidities in 20% of ADHD cases admitted to the clinic.²⁸ In the present study, of the ADHD cases, 33.37% had one, 41.7% had two, 10.2% had three, 3.7% had four, 5.6% had five, and 1.9% had six psychiatric comorbidities.

Psychiatric comorbidity may worsen the clinical picture in children and adolescents diagnosed with ADHD. A recently published study reports that psychiatric comorbidity increases social impairment among children with ADHD, but did not worsen academic functioning.⁴⁸ Likewise, certain comorbidities like oppositional defiant disorder may be particularly problematic for peer functioning, whereas mood/anxiety symptoms may be less impairing.⁴⁹

Withdrawn was reported to be the most common cause of social problems in ADHD-PI type, whereas it was social exclusion in ADHD-C type.⁵⁰ In the present study, oppositional defiant disorder was significantly more common in ADHD-C type, whereas anxiety disorders were encountered more frequently in ADHD-PI type. However, another study reported that the frequency of comorbidity showed no difference between ADHD subtypes.¹⁹

In this study, oppositional defiant disorder was observed to be the most frequent comorbidity in ADHD with a rate of 69.4%. The comorbidity of oppositional defiant disorder in ADHD has been found to be a risk factor for accompaniment of other disorders, predominantly anxiety symptoms.²³ Important family, social, and school-related problems are observed in ADHD cases accompanied by oppositional defiant disorder. These children are more punished and exposed to negative stimulus. The reverse situation is also considered; oppositional defiant disorder more frequently accompanies ADHD in cases having negative family functions.⁵¹

Harada et al reported higher frequency of school refusal and friendship problems when ADHD was accompanied by oppositional defiant disorder.⁵²

It has been reported that the presence of conduct disorders in ADHD is associated with more serious symptoms and that the risk for antisocial personality disorder and substance abuse and addiction is increased in these cases.⁵³ In the present study, the rate of conduct disorder was found to be low at 5.6%. Ghanizadeh reported this rate to be 9.9%.¹⁹ It has been reported that conduct disorder is more frequently accompanied in those with oppositional defiant disorder symptoms.⁵⁴ The presence of conduct disorder in ADHD is the most important indicator for the severity of the clinical picture and the rate of hospitalization is greater in this group.²⁶ In the present study, the frequency of conduct disorder was 4% in the girls and 6% in the boys; however, the difference was not significant (Fisher's exact test $P=1.000$).

We found that depression and anxiety disorder accompanied ADHD in 9.3% and 49.0% of the cases, respectively. With regard to sex, both comorbidities were more common in girls. It has been reported that conduct disorder and oppositional defiant disorder appear in early childhood in ADHD, whereas depression and anxiety symptoms appear at older ages.¹¹ In the present study, with regard to the age groups, the rate of depression was significantly higher in the adolescents as compared to the children (23.7% versus 1.4%, Fisher's exact test: $P<0.001$). Anxiety disorder was present in 60.5% of the adolescents and in 42.9% of the children; however, the difference was not significant ($\chi^2=2.41$, standard deviation =1, $P=0.121$). With respect to the subtypes of ADHD, the frequency of anxiety disorder was higher in ADHD-PI type as compared to ADHD-C type (73% versus 45.2%, $P=0.043$). Lahey et al found the frequency of anxiety disorder to be higher in children with attention disorder without hyperactivity as compared to the children with ADHD.³⁹ The results of the present study are in accordance with their findings.

Symptoms such as sleep disorders, concentration difficulty, and irritability observed in depression and symptoms such as sustained anxiety and failure of concentration observed in anxiety disorders may be confused with ADHD and may sometimes be misdiagnosed.^{55–57} Where the depression or anxiety symptoms accompany ADHD, both domains of psychopathology makes the diagnostic procedure complicated and ADHD symptoms may be more severe.^{58,59} It is debatable how treatment should be planned when these disorders accompany ADHD. In general, the predominant disorder is to be treated as a priority.⁵⁸ Some psychiatric symptoms observed in family

members may inform opinions about additional diagnoses to the cases.⁶⁰

While it has been reported that ADHD and mood disorders are observed together in 20%–30% of cases, it remains controversial whether mood disorders develop secondary to long-term ADHD symptoms or if they appear independent from ADHD symptoms.⁵⁵ Recent family, genetic, and long-term follow-up studies have demonstrated that ADHD and major depressive disorder share common familial risk and appear independent from each other.^{55,61} Compared to high rates (over 30%) in Western countries, the rate of comorbid mood disorder was found to be lower in cases with ADHD in the present study (12%).^{3,12,47} This finding could be associated with the assumptions that parents in our clinical sample may attend to their children's extravertive symptoms (eg, inattention, hyperactivity, aggression, and impulsive behavior) rather than their emotional distress. Thus, parents might have reported emotional symptoms of their children to a lesser extent. The children being reluctant to express negative emotions could also be another reason. In brief, low frequency of mood disorders may be a consequence of cultural differences.

According to our results, the most common anxiety disorder was generalized anxiety disorder followed in descending order by separation anxiety disorder, social phobia, panic disorder, obsessive–compulsive disorder, and post-traumatic stress disorder. With respect to the age group, the frequency of separation anxiety disorder was higher in the children than that in the adolescents (25.7% versus 7.9%, $P=0.025$). However, the frequencies of social phobia and obsessive–compulsive disorder were higher in the adolescents than in the children (34.2% versus 10.0%, $P=0.002$ for social phobia; 13.2% versus 1.4%, $P=0.011$ for obsessive–compulsive disorder). Ghanizadeh found the rates of separation anxiety disorder and obsessive–compulsive disorder to be 19.8% and 7.6%, respectively, and reported no difference between sexes.¹⁹ Geller et al reported that obsessive–compulsive disorder frequently accompanied ADHD, and in the case of concurrence of both conditions, academic and social skills were affected more, and became more resistant to therapy.⁶²

In this study, in terms of the subtypes of ADHD, the frequency of social phobia was higher in ADHD-PI type; it was present in 60% of the cases diagnosed with ADHD-PI type and in 11.8% of the cases diagnosed with ADHD-C type ($P<0.001$). Of the patients with anxiety disorder, 47.2% had one, 30.2% had two, 20.7% had three, and 1.9% had four anxiety disorders. The rate of anxiety disorder was similar as compared to that found in previous studies. Since more than

52% of the patients with ADHD have more than two anxiety disorders, the clinician should carefully examine the anxiety symptoms of patients with ADHD.

On the other hand, ADHD was accompanied by bipolar disorder in three cases. All three cases were male adolescents and diagnosed with ADHD-C type. Biederman et al compared 140 children and adolescents with ADHD to 120 healthy children and adolescent controls aged between 6 and 17 years during a 4-year follow-up study.⁶³ They reported the rate of bipolar disorder to be 22% in children and 28% in adolescents with ADHD.⁶³ In the study by Faraone et al investigating ADHD in childhood-onset mania, 68 manic children and 42 manic adolescents were compared with peers with other mental disorders and with healthy controls.⁶⁴ They found the rate of ADHD to be 93% in manic children, 88% in adolescents with childhood-onset mania, and 59% in adolescents with adolescent-onset mania.⁶⁴ They suggested that ADHD and bipolar disorder comorbidity did not result from overlapping symptoms.⁶⁴

In our sample, 14.8% of the cases had tic disorder. With regard to sex, all of the patients diagnosed with tic disorder were male. Evidence concerning the influence of an accompanying tic disorder on the course of ADHD is not as certain the evidence for the accompaniment of conduct disorders; however, it has been reported that the majority of cases with tic disorder accompanying ADHD develop obsessive–compulsive symptoms in the adolescent period.³³

In addition, ADHD was accompanied by elimination disorders in 27.8% of the cases. It was more frequent in children than in adolescents (37.1% versus 10.5%, $P=0.003$).

In conclusion, the present study found a high rate of comorbidity (96.3%) in cases with ADHD. The most common comorbidities were determined to be oppositional defiant disorder and anxiety disorders. Elimination disorders, tic disorders, and mood disorders also accompanied ADHD. Depressive disorders and anxiety disorders were more frequent in girls than in boys. Disruptive behavior disorder and oppositional defiant disorder were more common in ADHD-C type, whereas anxiety disorders and social phobia were more common in ADHD-PI type. Mood disorders, depression, social phobia, and obsessive–compulsive disorder accompanying ADHD were observed more frequently in the adolescents and separation anxiety disorders and elimination disorder accompanying ADHD were observed more frequently in the children.

Limited sample size, and not evaluating other variables including socioeconomic status and good parental care in shared families are some limitations of the present study.

According to our results, when a diagnostic tool was used to assess the presence of comorbid psychiatric disorders in children and adolescents diagnosed with ADHD, almost all cases had at least one comorbid diagnosis. Therefore, especially in the clinical sample, ADHD cases should not be solely interpreted with ADHD symptom domains, instead they should be investigated properly in terms of accompanying psychiatric disorders.

Disclosure

The authors have no conflicts of interest to declare in this work.

References

- Biederman J. Attention-deficit/hyperactivity disorder: a selective overview. *Biol Psychiatry*. 2005;57(11):1215–1220.
- Mueller AK, Fuermaier AB, Koerts J, Tucha L. Stigma in attention deficit hyperactivity disorder. *Atten Defic Hyperact Disord*. 2012;4(3):101–114.
- Spencer TJ, Biederman J, Mick E. Attention-deficit/hyperactivity disorder: diagnosis, lifespan, comorbidities, and neurobiology. *J Pediatr Psychol*. 2007;32(6):631–642.
- Burd L, Klug MG, Coumbe MJ, Kerbeshian J. Children and adolescents with attention deficit-hyperactivity disorder: 1. Prevalence and cost of care. *J Child Neurol*. 2003;18(8):555–561.
- Vasconcelos MM, Werner J Jr, Malheiros AF, Lima DF, Santos IS, Barbosa JB. [Attention deficit/hyperactivity disorder prevalence in an inner city elementary school]. *Arq Neuropsiquiatr*. 2003;61(1):67–73. Portuguese.
- Biederman J, Petty CR, O'Connor KB, Hyder LL, Faraone SV. Predictors of persistence in girls with attention deficit hyperactivity disorder: results from an 11-year controlled follow-up study. *Acta Psychiatr Scand*. 2012;125(2):147–156.
- Manor I, Rozen S, Zemishlani Z, Weizman A, Zalsman G. When does it end? Attention-deficit/hyperactivity disorder in the middle aged and older populations. *Clin Neuropharmacol*. 2011;34(4):148–154.
- Matte B, Rohde LA, Grevet EH. ADHD in adults: a concept in evolution. *Atten Defic Hyperact Disord*. 2012;4(2):53–62.
- Rösler M, Retz W, Yaqoobi K, Burg E, Retz-Junginger, P. Attention deficit/hyperactivity disorder in female offenders: prevalence, psychiatric comorbidity and psychosocial implications. *Eur Arch Psychiatry Clin Neurosci*. 2009;259(2):98–105.
- Sobanski E, Brüggemann D, Alm B, et al. Subtype differences in adults with attention-deficit/hyperactivity disorder (ADHD) with regard to ADHD-symptoms, psychiatric comorbidity and psychosocial adjustment. *Eur Psychiatry*. 2008;23(2):142–149.
- Connor DF, Edwards G, Fletcher KE, Baird J, Barkley RA, Steingard RJ. Correlates of comorbid psychopathology in children with ADHD. *J Am Acad Child Adolesc Psychiatry*. 2003;42(2):193–200.
- Waxmonsky J. Assessment and treatment of attention deficit hyperactivity disorder in children with comorbid psychiatric illness. *Curr Opin Pediatr*. 2003;15(5):476–482.
- Bakare MO. Attention deficit hyperactivity symptoms and disorder (ADHD) among African children: a review of epidemiology and comorbidities. *Afr J Psychiatry (Johannesbg)*. 2012;15(5):358–361.
- Smalley SL, McGough JJ, Moilanen IK, et al. Prevalence and psychiatric comorbidity of attention-deficit/hyperactivity disorder in an adolescent Finnish population. *J Am Acad Child Adolesc Psychiatry*. 2007;46(12):1575–1583.
- Hergüner S, Hergüner A. Psychiatric comorbidity in children and adolescents with attention deficit hyperactivity disorder. *Archives of Neuropsychiatry*. 2012;49:114–118. Turkish.
- Gau SS, Ni HC, Shang CY, et al. Psychiatric comorbidity among children and adolescents with and without persistent attention-deficit hyperactivity disorder. *Aust N Z J Psychiatry*. 2010;44(2):135–143.
- Huh Y, Choi I, Song M, Kim S, Hong SD, Joung Y. A comparison of comorbidity and psychological outcomes in children and adolescents with attention-deficit/hyperactivity disorder. *Psychiatry Investig*. 2011;8(2):95–101.
- Jensen PS, Martin D, Cantwell DP. Comorbidity in ADHD: implications for research, practice, and DSM-V. *J Am Acad Child Adolesc Psychiatry*. 1997;36(8):1065–1079.
- Ghanizadeh A. Psychiatric comorbidity differences in clinic-referred children and adolescents with ADHD according to the subtypes and gender. *J Child Neurol*. 2009;24(6):679–684.
- Hechtman L. Assessment and diagnosis of attention-deficit/hyperactivity disorder. *Child Adolesc Psychiatr Clin N Am*. 2000;9(3):481–498.
- Lahey BB, Loeber R, Quay HC, Frick PJ, Grimm J. Oppositional defiant and conduct disorders: Issues to be resolved for DSM-IV. *J Am Acad Child Adolesc Psychiatry*. 1992;31(3):539–546.
- Hare WA, Inverso MJ, Yolton RL. Neuropathology of the hyperkinetic child. *J Am Optom Assoc*. 1980;51(1):27–30.
- Lavigne JV, Cicchetti C, Gibbons RD, Binns HJ, Larsen L, DeVito C. Oppositional defiant disorder with onset in preschool years: longitudinal stability and pathways to other disorders. *J Am Acad Child Adolesc Psychiatry*. 2001;40(12):1393–1400.
- Mick E, Biederman J, Faraone SV, Sayer J, Kleinman S. Case-control study of attention-deficit hyperactivity disorder and maternal smoking, alcohol use, and drug use during pregnancy. *J Am Acad Child Adolesc Psychiatry*. 2002;41(4):378–385.
- Faraone SV, Biederman J, Wozniak J, Mundy E, Mennin D, O'Donnell D. Is comorbidity with ADHD a marker for juvenile-onset mania? *J Am Acad Child Adolesc Psychiatry*. 1997;36(8):1046–1055.
- Kadesjö B, Gillberg C. The comorbidity of ADHD in the general population of Swedish school-age children. *J Child Psychol Psychiatry*. 2001;42(4):487–492.
- Wilson JM, Marcotte AC. Psychosocial adjustment and educational outcome in adolescents with a childhood diagnosis of attention deficit disorder. *J Am Acad Child Adolesc Psychiatry*. 1996;35(5):579–587.
- Biederman J, Newcorn J, Sprich S. Comorbidity of attention deficit hyperactivity disorder with conduct, depressive, anxiety, and other disorders. *Am J Psychiatry*. 1991;148(5):564–577.
- Ishii T, Takahashi O, Kawamura Y, Ohta T. Comorbidity in attention deficit-hyperactivity disorder. *Psychiatry Clin Neurosci*. 2003;57(5):457–463.
- Faraone SV, Biederman J, Monuteaux MC. Attention deficit hyperactivity disorder with bipolar disorder in girls: further evidence for a familial subtype? *J Affect Disord*. 2001;64(1):19–26.
- Wilder-Willis KE, Sax KW, Rosenberg HL, Fleck DE, Shear PK, Strakowski SM. Persistent attentional dysfunction in remitted bipolar disorder. *Bipolar Disord*. 2001;3(2):58–62.
- Peterson BS, Leckman JF. The temporal dynamics of tics in Gilles de la Tourette syndrome. *Biol Psychiatry*. 1998;44(12):1337–1348.
- Peterson BS, Pine DS, Cohen P, Brook JS. Prospective, longitudinal study of tic, obsessive-compulsive, and attention-deficit/hyperactivity disorders in an epidemiological sample. *J Am Acad Child Adolesc Psychiatry*. 2001;40(6):685–695.
- Walsh T, Menvielle E. Disorders of Elimination. In: Wiener JM, Dulcan MK, editors. *Textbook of Child and Adolescent Psychiatry*. 3rd ed. Washington, DC: American Psychiatric Publishing, Inc; 2004:743–750.

35. Esposito M, Gallai B, Parisi L, et al. Primary nocturnal enuresis as a risk factor for sleep disorders: an observational questionnaire-based multicenter study. *Neuropsychiatr Dis Treat*. 2013;9:437–443.
36. Esposito M, Gallai B, Parisi L, et al. Visuomotor competencies and primary monosymptomatic nocturnal enuresis in prepubertal aged children. *Neuropsychiatr Dis Treat*. 2013;9:921–926.
37. Robson WL, Jackson H, Blackhurst D, Leung AK. Enuresis in children with attention-deficit hyperactivity disorder. *South Med J*. 1997;90(5):503–505.
38. Bailey JN, Ornitz EM, Gehricke JG, Gabikian P, Russell AT, Smalley SL. Transmission of primary nocturnal enuresis and attention deficit hyperactivity disorder. *Acta Paediatr*. 1999;88(12):1364–1368.
39. Lahey BB, Pelham WE, Schaughency EA, et al. Dimensions and types of attention deficit disorder. *J Am Acad Child Adolesc Psychiatry*. 1988;27(3):330–335.
40. Kaufman J, Birmaher B, Brent D, et al. Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL): initial reliability and validity data. *J Am Acad Child Adolesc Psychiatry*. 1997;36(7):980–988.
41. Gökler B, Ünal F, Pehlivanlı B, Kültür EÇ, Akdemir D, Taner Y. Reliability and Validity of Schedule for Affective Disorders and Schizophrenia for School Age Children-Present and Lifetime Version-Turkish Version (K-SADS-PL-T). *Turk J Child Adolesc Ment Health*. 2004;11(3):109–116.
42. Willcutt EG. The prevalence of DSM-IV attention-deficit/hyperactivity disorder: a meta-analytic review. *Neurotherapeutics*. 2012;9(3):490–499.
43. Byun H, Yang J, Lee M, et al. Psychiatric comorbidity in Korean children and adolescents with attention-deficit hyperactivity disorder: psychopathology according to subtype. *Yonsei Med J*. 2006;47(1):113–121.
44. Gaub M, Carlson CL. Gender differences in ADHD: a meta-analysis and critical review. *J Am Acad Child Adolesc Psychiatry*. 1997;36(8):1036–1045.
45. August GJ, Realmuto GM, MacDonald AW, Nugent SM, Crosby R. Prevalence of ADHD and comorbid disorders among elementary school children screened for disruptive behavior. *J Abnorm Child Psychol*. 1996;24(5):571–595.
46. The MTA Cooperative Group. A 14-month randomized clinical trial of treatment strategies for attention-deficit/hyperactivity disorder. *Arch Gen Psychiatry*. 1999;56(12):1073–1086.
47. Wilens TE, Biederman J, Brown S, Tanguay S, Monuteaux MC, Blake C, et al. Psychiatric comorbidity and functioning in clinically referred preschool children and school age youths with ADHD. *J Am Acad Child Adolesc Psychiatry*. 2002;41(3):262–268.
48. Becker SP, Langberg JM, Vaughn AJ, Epstein JN. Clinical utility of the Vanderbilt ADHD diagnostic parent rating scale comorbidity screening scales. *J Dev Behav Pediatr*. 2012;33(3):221–228.
49. Becker SP, Luebke AM, Langberg JM. Co-occurring mental health problems and peer functioning among youth with attention-deficit/hyperactivity disorder: a review and recommendations for future research. *Clin Child Fam Psychol Rev*. 2012;15(4):279–302.
50. Hinshaw SP. Preadolescent girls with attention-deficit/hyperactivity disorder: I. Background characteristics, comorbidity, cognitive and social functioning, and parenting practices. *J Consult Clin Psychol*. 2002;70(5):1086–1098.
51. Strayhorn JM, Bickel DD. Reduction in children's symptoms of attention deficit hyperactivity disorder and oppositional defiant disorder during individual tutoring as compared with classroom instruction. *Psychol Rep*. 2002;91(1):69–80.
52. Harada Y, Yamazaki T, Saitoh K. Psychosocial problems in attention-deficit hyperactivity disorder with oppositional defiant disorder. *Psychiatry Clin Neurosci*. 2002;56(4):365–369.
53. Biederman J, Faraone S, Milberger S, et al. Predictors of persistence and remission of ADHD into adolescence: results from a four-year prospective follow-up study. *J Am Acad Child Adolesc Psychiatry*. 1996;35(3):343–351.
54. Burt SA, Krueger RF, McGue M, Iacono WG. Sources of covariation among attention-deficit/hyperactivity disorder, oppositional defiant disorder, and conduct disorder: the importance of shared environment. *J Abnorm Child Psychol*. 2001;110(4):516–525.
55. Biederman J, Mick E, Faraone SV. Depression in attention deficit hyperactivity disorder (ADHD) children: “true” depression or demoralization? *J Affect Disord*. 1998;47(1–3):113–122.
56. Schatz DB, Rostain AL. ADHD with comorbid anxiety: a review of the current literature. *J Atten Disord*. 2006;10(2):141–149.
57. Plizska SR. Attention Deficit/Hyperactivity Disorder. In: Dulcan MK, editor. *Dulcan's Textbook of Child and Adolescent Psychiatry*. Washington, DC: American Psychiatric Publishing, Inc; 2010:205–222.
58. Cohen R, Lohr I, Paul R, Boland R. Impairments of attention and effort among patients with major affective disorders. *J Neuropsychiatry Clin Neurosci*. 2001;13(3):385–395.
59. Pearson DA, Santos CW, Roache JD, et al. Treatment effects of methylphenidate on behavioral adjustment in children with mental retardation and ADHD. *J Am Acad Child Adolesc Psychiatry*. 2003;42(2):209–216.
60. O'Brien LM, Ivanenko A, Crabtree VM, et al. Sleep disturbances in children with attention deficit hyperactivity disorder. *Pediatr Res*. 2003;54(2):237–243.
61. Faraone SV, Biederman J. Do attention deficit hyperactivity disorder and major depression share familial risk factors? *J Nerv Ment Dis*. 1997;185(9):533–541.
62. Geller DA, Coffey B, Faraone S, et al. Does comorbid attention-deficit/hyperactivity disorder impact the clinical expression of pediatric obsessive-compulsive disorder? *CNS Spectr*. 2003;8(4):259–264.
63. Biederman J, Russell R, Soriano J, Wozniak J, Faraone SV. Clinical features of children with both ADHD and mania: does ascertainment source make a difference? *J Affect Disord*. 1998;51(2):101–112.
64. Faraone SV, Biederman J, Mennin D, Wozniak J, Spencer T. Attention-deficit hyperactivity disorder with bipolar disorder: a familial subtype? *J Am Acad Child Adolesc Psychiatry*. 1997;36(10):1378–1387; discussion 1387–1390.

Neuropsychiatric Disease and Treatment

Publish your work in this journal

Neuropsychiatric Disease and Treatment is an international, peer-reviewed journal of clinical therapeutics and pharmacology focusing on concise rapid reporting of clinical or pre-clinical studies on a range of neuropsychiatric and neurological disorders. This journal is indexed on PubMed Central, the 'PsycINFO' database and CAS.

Submit your manuscript here: <http://www.dovepress.com/neuropsychiatric-disease-and-treatment-journal>

Dovepress

The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.