Anxiety Disorders Comorbidity in Children and Adolescents with Attention Deficit Hyperactivity Disorder

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ABSTRACT

Introduction: Our aim is to investigate the prevalence of comorbidity of anxiety disorders (AD) among patients newly diagnosed with attention deficit hyperactivity disorder (ADHD) and to compare symptom severity of ADHD and sociodemographic parameters between patients with and without AD.

Methods: Among 1683 children and adolescents admitted to Kocaeli University Medical Faculty, Child and Adolescent Mental Health Outpatient Clinic, 447 children and adolescents, who were preliminarily diagnosed as ADHD by clinical interview based on Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV), were invited to participate in the second phase of the study. Kiddie Schedule for Affective Disorder and Schizophrenia, Present and Lifetime-Turkish Version were applied to children and adolescents with ADHD and one of their parents to support the diagnoses of both ADHD and AD. Mothers, fathers, and teachers of

the children were asked to complete DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale.

Results: Our study group comprised 170 children and adolescents diagnosed with ADHD of whom 19.4% were girls and 80.6% were boys; 27.6% of patients diagnosed with ADHD showed AD comorbidity. Age of the parents at birth of the patients with AD was significantly lower than that of patients without AD.

Conclusion: In line with the previous studies, the comorbidity rate of AD was found to be higher among patients with ADHD than general population and clinical sample without ADHD. The possibility of comorbidity of AD in patients with ADHD should be considered because higher rates of AD are observed in ADHD and comorbidities of AD.

Keywords: ADHD, anxiety disorder, sociodemographic parameters

INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a neuropsychiatric disorder that may extend to adolescence and adulthood from childhood and cause impairment of cognitive functions along with attention deficit, hyperactivity, and impulsiveness symptoms (1,2). It is known that ADHD, one of the most common psychiatric disorders of childhood, could cause substantial academic, social, and mental problems and may continue for the life time (1,2). ADHD is considered as an important public health problem because it impairs the functionality of the individual and may influence both the family and social environment (3). The prevalence of ADHD among school age children has been reported to be 3%–7%, whereas worldwide prevalence has been reported to be 5.29% (4,5). It was reported that children and adolescents with ADHD have the comorbidity of oppositional defiant disorder (ODD) in 30%–60% cases, anxiety disorders (AD) in 15%–50% cases, learning disorders in 20%–60% cases, mood disorders (MD) in 3%–75% cases, and conduct disorder (CD) in 15–50% cases (6,7,8,9). Previous studies have reported that the clinical characteristics, severity, and long-term prognosis of ADHD as well as therapy response and perceived quality of life of the patients are influenced in the presence of comorbidities (10,11,12).

AD are one of the most common mental disorders seen in children and adolescents (13). Anxiety is a protective and adaptive emotion that could be defined as restlessness accompanied by expectation of danger and might vary depending on life experiences. AD are a disorder characterized by fear or agitation that causes substantial distress and loss of function (14,15). Studies found that anxiety and depressive disorders are more prevalent in untreated ADHD cases as compared with the control groups (16). In the children and adolescents with ADHD, working memory and cognitive processes are likely to be negatively influenced in the presence of AD comorbidity (17). In medical literature, it is being discussed whether anxiety is a component of ADHD or a condition secondary to ADHD. Although some authors suggest that anxiety may be associated with the pathogenesis of ADHD, some suggest that AD accompanying ADHD may be another type of ADHD (18,19). The theorem of Schachar et al. (20) suggests that impaired information process in ADHD impairs adaptation to academic norms and this causes anxiety. In the executive function disorder model of Barkley (21), the author has reported that impairment in executive functions impairs the social behaviors and the relationships with family and friends and this may cause anx-

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ity. Levy (19) has suggested that impairment in mesolimbic, mesocortical, and nigrostriatal cycles because of impairment in the physiology of nucleus accumbency in ADHD causes anxiety. Approaching to this situation through a different angle, ADHD-like symptoms such as hyperactivity and inattentiveness may also be observed in AD (22). In AD, the attention is selectively focused on threat perception causing substantial impairment in attention (23); this cause inadequate concentration to the other activities on progress (23). Beck and Emery (24) reported concentration difficulty in 86% of the patients with AD. Along with difficulty in concentration and decreased attention to other stimulants, fatigue can also be observed as a result of the energy consumed to search the environment for the clues of threat (25). Some studies that have used quantitative measurement tools have revealed impairment in the function of maintaining attention (25). Because inattentiveness is a component of ADHD predominantly inattentive subtype (ADHD-IA) in particular, the differential diagnosis of AD and ADHD-IA becomes more difficult and it is not always easy to identify whether inattentiveness results from AD or from ADHD (4,22). Hence, a child with AD may sometimes be misdiagnosed with ADHD (26).

Because AD comorbidity enhances cognitive insufficiency in ADHD and because individuals with AD comorbidity have higher academic and social difficulties, we aimed to explore the prevalence of AD comorbidity in ADHD and to investigate the severity of ADHD and sociodemographic characteristics in ADHD cases with and without AD (17,27,28).

METHODS

Patient Selection

The study was conducted between January and July 2010 at Kocaeli University Faculty of Medicine, Outpatient Clinic of Child and Adolescent Psychiatry. The sample of the present study included 6–16-year-old children and adolescents that presented to Kocaeli University Faculty of Medicine, Outpatient Clinic of Children and Adolescent Psychiatry within a 6-month period between January and July 2010 and were diagnosed with ADHD via Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV)-based clinical interviews.

The inclusion criteria for the sample group included not being diagnosed with ADHD previously; absence of serious disease such as paralysis, blindness, and deafness; absence of a psychotic disorder; absence of any organic disease such as epilepsy that could cause the symptoms of ADHD; and absence of mental retardation [A total intelligence score of ≥ 70 in Wechsler Intelligence Scale for Children-Revised (WISC-R) form].

Implementation

A total of 1683 children and adolescents were admitted in our clinic between January and July 2010. Four hundred and forty seven children and adolescents, who have been prediagnosed with ADHD via DSM-IV-based clinical interview, were invited for the second phase of the study. The study was approved by the Kocaeli Clinical Researches Ethical Committee. The patients and their families were informed both verbally and in writing regarding the aim and method of the study and their consents were obtained. Of the 447 subjects invited to the study, 26 refused to participate in the study and 155 did not attend the second interview. Parents and teachers of the children and adolescents participated in the study were asked to complete DSM-IV-based Child and Adolescent Behavioral Disorders Screening and Rating Scale (T-DSM-IV-S). In addition, WISC-R was performed in the cases prediagnosed with ADHD. The cases, which required the exclusion of organic diseases that may cause ADHD symptoms, were directed to the Kocaeli University Faculty of Medicine, Department of Pediatrics. Detailed clinical interview was performed in 266 cases pre-

diagnosed with ADHD and attended the second interview. On the clinical interview, 42 of these cases were not diagnosed with ADHD and 54 did not fulfill the inclusion criteria (Figure 1). Sociodemographic characteristics of 170 children and adolescents that participated in the study were evaluated via sociodemographic data form structured by the researcher. To confirm the diagnoses of ADHD and AD in the participants, Schedule for Affective Disorders and Schizophrenia for School Age Children, Present and Lifetime Version-Turkish Version (KSADS-PL-T), a semi-structured diagnostic interview, was performed both in the patients and in one of the parents. Evaluation was completed in three phases: prediagnosis, detailed diagnostic interview, and semi-structured diagnostic interview.

MATERIALS

Sociodemographic Data Form

Sociodemographic data form was prepared by the researcher to inquire regarding the age and sex of the child, age and education status of the mother and father; whether mother and father are together; income per individual in the family; number of siblings, and personal and family medical and psychiatric history. This form, containing 35 questions, was completed by the researcher on the basis of the information obtained from the families.

Schedule for Affective Disorders and Schizophrenia for School Age Children, Present and Lifetime Version (KSADS- PL)

Schedule for Affective Disorders and Schizophrenia for School Age Children, Present and Lifetime Version is a semi-structured interview scale was developed by Kauffman et al. (29) to diagnose mental disorders in 6–18-year-old children and adolescents, according to the diagnostic criteria in Diagnostic and Statistical Manual of Mental Disorders, 3rd edition and DSM-IV. KSADS- PL is performed by interviewing with the child and parents and is finally assessed considering the information obtained from all sources. If there are inconsistency between the information obtained from different sources, the clinician makes decision based on his or her clinical judgment (30). The validity and reliability study of Turkish version of the interview form was performed in 2004 by Gökler et al. (30).

T-DSM-IV-S

This scale was developed by Turgay taking DSM-IV diagnostic criteria as the basis. It comprises 41 questions, of which 9 inquire regarding inattentiveness, 9 regarding hyperactivity and impulsiveness, 8 regarding ODD, and 15 regarding CD. Each item is rated as 0: not at all, 1: just a little, 2: quite a bit, and 3: very much (31). The validity and reliability of the Turkish version of the scale was performed by Ercan et al. (32).

WISC-R

WISC-R is the revised form of Wechsler Intelligence Scale for Children (WISC) developed in 1949 by Wechsler (33). WISC-R consists of two sections: verbal and performance. Total intelligence score is calculated using verbal and performance scores. Standardization of WISC-R in Turkish children was performed by Savaşır and Şahin (34) in the children in the 6–16-year age group.

Statistical Analysis

Data obtained after evaluations were analyzed using Statistical Program for Social Sciences (SPSS Inc., Chicago, IL, USA) v.16. Numerical data that were consistent with normal distribution were analyzed using T-test, whereas the data that were inconsistent with normal distribution were analyzed using Mann-Whitney U test. Chi-square test was used for the comparison of categorical variables. When the expected value was lower than 5 in the 2×2 contingency table, the p value was determined using

Fisher's correction. The level of significance was considered to be $p < 0.05$ for all analyses.

RESULTS

The study was conducted in 170 pediatric patients diagnosed with ADHD, of which 33 (19.4%) were girls and 137 (80.6%) were boys (Table 1). The boy-to-girl ratio was found to be 4.15:1. Although there was no difference between the cases with and without AD comorbidity in terms of sex, the prevalence of generalized anxiety disorder (GAD) was found higher in girls than in boys (Table 2). The mean age of all cases in the study was 9.0 ± 2.3 years. The mean age of the cases with AD comorbidity was 9.0 ± 2.4 years, whereas the mean age of the cases without AD comorbidity was 8.2 ± 2.4 years. No statistically significant difference was observed between the mean ages of the cases with and without AD comorbidity.

With regard to the mothers' age at the time of birth of the child, the mean age was 23.9 ± 4.9 years for the mothers of the cases with AD comorbidity and 26 ± 5.2 years for the mothers of the cases without AD comorbidity; whereas the mean age for the fathers at the time of birth of the child for the cases with and without AD comorbidity was 27.9 ± 5.7 years and 29.9 ± 5.1 years, respectively (Table 3). The lower mean age of the mothers and fathers of the cases with AD comorbidity versus the cases without AD comorbidity was found to be statistically significant.

Of the 170 children and adolescents with ADHD, 83 (48.8%) had ADHD-IA, 8 (4.7%) had ADHD predominantly hyperactive impulsive subtype,

and 79 (46.5%) had ADHD combined subtype (ADHD-C). AD comorbidity was determined in 47 (27.6%) of these children and adolescents with ADHD in the form of specific phobia (SP) in 24 (14.2%), separation anxiety disorder (SeAD) in 13 (7.6%), anxiety disorder not otherwise specified (AD-NOS) in 7 (4.2%), GAD in 6 (3.6%), social anxiety disorder (SAD) in 5 (3%), and obsessive compulsive disorder (OCD) in 4 (2.4%; Figure 2). Single anxiety disorder was determined in 36 (76.6%), two AD were determined in 10 (21.3%), and three AD were determined in 1 (2.1%) of these cases. On comparing the subtypes of ADHD in terms of AD comorbidity, no statistically significant difference was found. There was no statistically significant difference between the cases with and without AD comorbidity in terms of WISC-R scores and T-DSM-IV-S scores (Tables 4, 5). There was no statistically significant difference between the cases with and without AD comorbidity in terms of delivery type, education and working status of the mother and father, family type, and monthly income per family member.

DISCUSSION

ADHD is generally accompanied by mental disorders including ODD, AD, CD, MD, and learning disorders (4,6). Cross-sectional, retrospective, and follow-up studies reveal that ADHD enhances the risk of mood disorders, AD, and drug abuse in childhood, adolescence, and adulthood (35). Studies demonstrated that the prevalence of AD is 5%–15% in the population, whereas it increases up to 15%–35% in the cases diagnosed with ADHD (36,37). In the present study, AD comorbidity was determined in 27.6% of 170 cases diagnosed with ADHD. In Turkey, studies conducted

Table 1. Sociodemographic characteristics of ADHD cases with and without AD comorbidity

	Total n=170		AD n=47		No AD n=123		Statistical testing*	
	n	%**	n	%**	n	%**	χ ²	p
Gender								
Girl	33	19.4	13	27.6	20	16.3	2.825	0.093
Boy	137	80.6	34	72.3	103	83.7		
Education level								
1 st -5 th grade	136	80	37	78.7	99	80.5	4.126	0.248
6 th -8 th grade	29	17.1	10	22.3	19	15.4		
9 th -10 th grade	5	2.9	0	0.0	5	4.1		
Type of delivery								
Normal delivery	107	62.9	28	59.6	79	64.2	0.316	0.701
C/S	63	37.1	19	41.4	44	35.8		
The time of birth								
<38 week	30	17.6	9	19.2	21	17.0	0.066	0.832
≤38 week	140	82.4	38	80.8	102	83.0		
Mother's education level								
No education	3	1.7	0	0	3	2.4	3.011	0.222
Primary	115	67.7	36	76.6	79	64.2		
High school or university	52	30.6	11	23.4	41	33.3		
Father's education level								
No education	1	0.6	0	0	1	0.8	0.452	0.798
Primary	98	57.6	28	56.9	70	56.9		
High school or university	71	41.8	19	42.3	52	42.3		
Family type								
Nuclear family	123	72.4	33	70.2	90	73.1	1.042	0.594
Extended family	43	25.3	12	25.6	31	25.2		
Divorced family	4	2.4	2	4.2	2	1.7		
*Chi-Square test, **Column percentage, AD: anxiety disorder; C/S: A cesarean method								

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in the clinical samples showed the prevalence of AD to 6.1%–49% in the cases diagnosed with ADHD (9,12,38). These rates are consistent with the prevalence of AD found in the present study. Spencer et al. (36) conducted a study in a population sample and found the prevalence of AD comorbidity to be 27% in children with ADHD with a mean age of 11 years and to be 5% in the healthy control group; they reported that the prevalence of AD comorbidity increased to 35% in children with ADHD and to 9% in the healthy control group at the end of a 4-year follow-up period. Bauermeister et al. (39) conducted a study in children and adolescents aging 4–17 years and found the prevalence of AD comorbidity to be 24.43% in ADHD patients in the population sample and 33.51% in ADHD patients in the clinical sample. High prevalence of AD comorbidity in the abovementioned studies suggest that every difficulty experienced by the children and adolescents with ADHD are factors that forming the basis for AD comorbidity.

The age of the mothers and fathers at the time of birth of the cases with AD comorbidity was found to be significantly lower than that of other cases. Considering that children with ADHD have more difficult infancy

and childhood period as compared to the healthy children, it is thought that young parents with inadequate life experience would feel desperate, worried, and incapable. It was considered that the parents may exhibit an overprotective attitude because of their anxiety, may apply rigid punishment methods due to their feeling of incapability, or may exhibit denial against their children because of despair; each of this could facilitate the development of AD in the children.

Although the symptoms of ADHD are largely present in the early childhood, parents and teachers realize its unfavorable influence on functionality generally at the primary school age (1). Prolonged presenting time and delayed treatment may make the symptoms more severe in the cases with ADHD (40). In the present study the mean age was 9.04 ± 2.35 years in the cases with AD comorbidity and 8.19 ± 2.38 years in the cases without AD comorbidity. Although there is no statistically significant difference in terms of mean age, it is observed that the mean age of the cases with AD comorbidity is higher. Consistent with the present study, Connor et al. (41) found the mean age of the cases with AD comorbidity to be higher than the cases without AD comorbidity. Pliszka determined that the chil-

Table 2. Gender distribution of the cases with AD comorbidity

Anxiety disorders		Girl (n=33)		Boy (n=137)		Statistical testing *	
		n	%**	n	%**	χ^2	p
SP	AD	7	21.2	16	11.7	2.06	0.16
	No AD	26	78.8	121	88.3		
SAD	AD	1	3.0	4	2.9	0.00	1.00
	No AD	32	97.0	133	97.1		
SeAD	AD	3	9.1	10	7.3	0.12	0.71
	No AD	30	90.9	127	92.7		
OCD	AD	2	6.1	2	1.5	2.45	0.17
	No AD	31	93.9	135	98.5		
GAD	AD	4	12.1	2	1.5	8.87	0.01
	No AD	29	87.9	135	98.5		
AD-NOS	AD	1	3.0	6	4.4	0.12	1.00
	No AD	32	97.0	131	95.6		

*Chi-Square test, **Column percentage, SP: specific phobia; SAD: social anxiety disorder; SeAD: separation anxiety disorder; OCD: obsessive-compulsive disorder; GAD: generalized anxiety disorder; AD-NOS: anxiety disorder not otherwise specified

Table 3. The average age for the parents during the birth of cases with and without AD comorbidity

Parental age	AD				No AD				Statistical testing*	
	Mean	Median	SD	Min-max	Mean	Median	SD	Min-max	Z	p
Mother	23.9	23	4.9	16-37	26	25	5.2	15-38	2.323	0.020
Father	27.9	27	5.7	18-44	29.9	30	5.1	19-45	2.663	0.008

*Mann-Whitney U test. AD: anxiety disorder; SD: standard deviation

dren with ADHD and AD comorbidity present to the clinic at a higher age than the children with ADHD alone (42). In the present study, the prevalence of AD comorbidity was 27.2% in the students of 5th or lower grade and 29.4% in the students of 6th or higher grade. Increase in the prevalence of AD comorbidity beginning from the 6th grade suggests that functional disorder becomes more prominent as the academic burden increases or the prevalence of AD increases with age.

In the present study, the prevalence of AD comorbidity was 39.4% in the girls and 24.8% in the boys with ADHD. Consistent with the literature, the prevalence of AD was found higher in girls versus boys (15). A

study conducted in the cases diagnosed with ADHD in a Turkish clinical sample showed the prevalence of AD comorbidity to be 68% in girls and 43.4% in boys, which is higher than that observed in the present study (9). The prevalence of GAD was found to be statistically significantly higher in girls versus boys with ADHD. This result is consistent with the information that GAD is more prevalent in girls (13). Worldwide prevalence of GAD in the children and adolescents has been reported to be 2%–9% for girls and 1%–4% for boys (13). The prevalence of GAD was found to be 2.3%–33.3% in the studies conducted in the cases with ADHD and 7% in a study conducted in the cases without ADHD in a Turkish clinical sample (9,38,43). The prevalence of AD (3.6%) found in the present study was consistent with the previous studies conducted in the cases with and without ADHD in a Turkish clinical sample. In the present study, the highest prevalence of GAD (6%) was found in the cases with ADHD-IA. In a study conducted in a Turkish clinical sample, the prevalence of GAD was the highest (33.3%) in ADHD-IA and ADHD-C (9).

In the present study, the highest prevalence (16.5%) of SP was found in ADHD-C. In addition, in another study, the highest prevalence (11.4%) of SP was found in ADHD-C (44). It has been reported that genetic factors are less effective in the development of SP versus the other AD and the history of the patients with SP generally reveals traumatic or worrisome life experiences (45). Based on this information, higher prevalence of SP in ADHD-C subtype is an expected result considering that the likelihood of children with ADHD accompanied by hyperactivity to be exposed to traumatic and worrisome life experiences is higher. In a study conducted in a Turkish clinical sample, of which 60.9% comprised cases

Table 4. Mother, father, and teacher T-DSM-IV-S scores for the cases with and without AD comorbidity

		AD				No AD				Statistical testing *
		M	Median	SD	Min-max	M	Median	SD	Min-max	
Mother T-DSM-IV-S sub-section scores	Attention deficit	16.8	18	5.7	6-27	16.4	17	6.2	1-27	Z=0.279 p=0.78
	Hyperactivity-impulsivity	13.3	15	6.9	1-26	14.3	13	1.2	0-23	Z=0.049 p=0.96
	ODD	11.0	10	5.8	1-22	10.2	9	6.5	0-24	Z=1.038 p=0.29
	CD	3.3	2	4.6	0-19	3.2	2	4.2	0-20	Z=0.317 p=0.751
	Total	44.5	41	1.9	11-92	43.2	39	1.8	9-92	Z=0.573 p=0.567
Father T-DSM-IV-S sub-section scores	Attention deficit	14.6	15	5.6	3-24	15.0	15	5.7	3-27	Z=0.289* p=0.66
	Hyperactivity-impulsivity	13.1	15	6.9	0-26	12.5	13	6.6	0-27	T=0.01** p=0.51
	ODD	10.1	8	6.3	1-22	9.2	8	6.0	0-24	Z=0.652* p=0.51
	CD	2.9	2	3.8	0-19	2.3	1	3.4	0-21	Z=0.885* p=0.37
	Total	40.7	39	1.9	4-75	39.0	37	1.7	8-99	Z=0.469* p=0.63
Teacher T-DSM-IV-S sub-section scores	Attention deficit	17.5	19	5.9	6-27	17.4	18	5.6	2-27	Z=0.75* p=0.94
	Hyperactivity-impulsivity	11.4	10	8.3	0-27	11.8	12	7.4	0-27	T=1.77** p=0.68
	ODD	10.0	10	7.1	0-24	9.7	8	1.1	0-24	Z=0.981* p=0.35
	CD	4.4	2	5.6	0-24	3.4	2	4.4	0-19	Z=1.253* p=0.21
	Total	43.1	43	2.1	8-88	41.8	39	1.8	6-87	T=2.19** p=0.69

*Mann-Whitney U test, **Student t test. AD: anxiety disorder; M: mean; SD: standard deviation; T-DSM-IV-S: DSM-IV-based child and adolescent behavioral disorders screening and rating scale; ODD: oppositional defiant disorder; CD: conduct disorder

with ADHD-C, the prevalence of SP was found to be 17.3% (38). Lower prevalence (14.2%) of SP in the present study versus the abovementioned study suggests that it may be associated with the prevalence (46.5%) of ADHD-C being lower in the present study versus that study.

In a Turkish clinical sample, the prevalence of SeAD was 12.8%–19.4% in the cases with ADHD, and it was 1.1%–1.5% in the girls and 0.8%–1% in the boys without ADHD (9,38,40). In the present study, although the prevalence of SeAD was lower (7.6%) in the clinical sample as compared with the studies performed in the cases with ADHD, it was found to be remarkably higher than the prevalence of SeAD found in the previous studies performed in the clinical samples without ADHD. The present study determined that prevalence of SeAD was the highest (9.6%) in

ADHD-IA. In a study performed in a Turkish clinical sample, the prevalence of separation AD was found to be the highest (20%) in ADHD-IA, whereas it was found to be the highest (24.3%) in ADHD-C in a Korean clinical sample (9,44). Higher prevalence of SeAD comorbidity in ADHD-IA suggests that it may be associated with higher prevalence of ADHD-IA and SeAD in girls.

It was found that the prevalence of SAD is 14.3%–18.5% in the cases with ADHD and 3.1%–4.1% in the cases without ADHD in a Turkish clinical sample (9,38,40,43). In a study conducted in a population-based sample in Germany, the prevalence of SAD was found to be 1.6% (46). The prevalence of SAD was lower (3%) in the present study as compared with the previous studies conducted in the Turkish clinical samples. Considering

Table 5. WISC-R-point values for the cases with and without anxiety disorders comorbidity

		WISC-R-point values				Statistical testing *	
		M	Median	SD	Min-max	Z	p
WISC-R verbal score	AD	89.5	89	11.8	67-116	1.752	0.08
	No AD	93.3	93	13.9	57-125		
WISC-R performance score	AD n	93.3	91	14.4	64-135	1.503	0.13
	No ADn	96.9	95	16.6	62-142		
WISC-R total score	AD	90.5	90	12.8	70-120	1.68	0.09
	No AD	94.7	94	14.6	70-128		

*Mann-Whitney U test. M: mean; SD: standard deviation; WISC-R: Wechsler intelligence scale for children-revised; AD: anxiety disorder

that the prevalence of SAD increases with age, it was thought that this outcome might be associated with the higher mean age of the sample in the previous studies as compared with the present study. In the present study, the prevalence of SAD was the highest (3.8%) in ADHD-C.

In the studies conducted in a Turkish clinical sample, the prevalence of OCD was found to be 3%–7.5% in the cases with ADHD, and it was 2.6%–2.8% in boys and 2.7%–4.8% in girls without ADHD (9,38,40,43,47). The prevalence of OCD found in the present study (2.4%) was lower than that found in the abovementioned studies. In the present study, the prevalence of OCD was the highest (3.6%) in ADHD-IA. In a study conducted in the Turkish clinical sample, the prevalence of OCD was found to be the highest (13.3%) in ADHD-IA, whereas it was found to be the highest (1.4%) in ADHD-C in the Korean clinical sample (9,44).

In the present study, total T-DSM-IV-S scores were found to be higher, although not statistically significant, in the parents and teachers of the cases with versus without AD comorbidity. These findings suggest that cases with severe symptoms of ADHD may have developed AD because of more difficulties faced in the social and academic life or AD comorbidity has made the situation more serious when ADHD is accompanied by AD (1,48).

In the present study, verbal, performance, and total scores of WISC-R were found to be lower, although not statistically significant, in the cases with AD comorbidity as compared with the scores of the other cases. In a study conducted in Turkey, no statistically significant difference was found between the WISC-R performance scores of the cases diagnosed with ADHD and the cases diagnosed with AD, and it was determined that the characteristics of WISC-R performance subtests are similar in the children with ADHD and with AD (49). Psychometric tests of the cases with ADHD revealed some problems including verbal memory difficulties, increase in the mistakes that result from slowed or variable response time and impulsiveness, inability to oppose the distractor, decreased sensitivity against mistakes, difficulty in mental calculation, spatial memory difficulties, and temporal representation difficulties (50). In addition, studies determined that high anxiety level unfavorably influences the processing memory and reaction time is longer in the cases with AD comorbidity (17,19,37). This finding is an expected result, considering that AD has unfavorable effects also on cognitive functions. In the present study, lower WISC-R total scores in the cases with AD comorbidity versus the cases without AD suggested that AD comorbidity has made the clinical picture severer consistent with the literature information that AD comorbidity enhances the severity of ADHD.

The limitations of the present study are that only the clinical samples were assessed for the severity of AD in the cases diagnosed with AD without

including a control group and that the sample size of this study was small. Nonattendance of the substantial proportion of the cases prediagnosed with ADHD to the second phase of the study and not assessing the reason for nonattendance and excluding some of the cases based on the exclusion criteria are the other limitations of this study. It is recommended to consider these conditions in the future studies.

It is known that prevalence of AD in the children and adolescents increases with age (51). The mean age of our sample is less because this study sample comprised untreated or newly diagnosed ADHD cases. Accordingly, it is believed that low prevalence of AD in the present study is related to this. We believe that equal number of patients randomly selected from each age group in the future studies investigating the prevalence of AD comorbidity in the cases with ADHD will show more reliable results.

In conclusion, AD comorbidity was determined in 27.6% of the cases diagnosed with ADHD and in 28.9% of the cases with ADHD-IA. Such high rates suggest that children and adolescents that are diagnosed with ADHD, particularly with ADHD-IA, should be evaluated for AD comorbidity. In addition to ADHD, it is known that hyperactivity and/or inattentiveness may also caused by several mental disorders of childhood, mainly depression and AD (52). Because inattentiveness is a common symptom of AD and ADHD and, in particular, is a basic symptom of ADHD-IA, differential diagnosis of AD and ADHD becomes more difficult and it is not always easy to determine whether inattentiveness result from AD, ADHD, or both. Hence, a child with AD may be misdiagnosed with ADHD. Differentiation of these two disorders, which have similar symptoms and are observed together, should be made precisely.

Considering that ADHD is a lifetime neurodevelopmental disorder and causes susceptibility to numerous mental disorders, problems that result from the nature of the disease and the problems that may be developed in the future secondary to the symptoms could be prevented by early diagnosis and treatment of the disease (2,4,6,53). From this viewpoint, it is believed that long-term monitoring of the patients and considering the probability of comorbidities would enable early recognition and treatment of the mental disorders that are likely to accompany (2).

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