

Psychiatric comorbidities in a sample of attention deficit hyperactivity disorder children in pediatric psychiatric clinics of El-Dakahlia Hospital of Mental Health

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Background

Attention deficit hyperactivity disorder (ADHD) is one of the most frequent psychiatric disorders of childhood and is frequently associated with comorbid illnesses.

Objective

to the objective of this article was to determine the frequency of psychiatric comorbidities in a sample of children diagnosed with ADHD in El-Dakahlia Hospital of Mental Health and to assess the association between ADHD subtypes and the distribution of comorbid psychiatric disorders.

Participants and methods

The sample included 60 children aged 6–12 years diagnosed with ADHD on the basis of *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed., criteria. Conner's Parent Rating Scale-revised and the L and Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version were applied to diagnose ADHD and comorbid psychiatric disorders. The Wechsler Intelligence Scale for Children was used to assess the intelligence quotient of all selected children.

Results

The prevalence of total psychiatric comorbidities in ADHD cases was 90% according to Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version. The most frequent psychiatric comorbid disorder was oppositional defiant disorder (55%), followed by comorbid nocturnal enuresis (33.3%), generalized anxiety disorder (33.3%), and depressive disorders (16.7%). Oppositional defiant disorder was more frequent in children diagnosed with ADHD-combined type (71.4%). Specific phobia disorder was more frequent in children diagnosed with ADHD-inattentive type (36.4%). There was no significant difference between females and males with respect to the prevalence of comorbid disorders.

Conclusion

High rates of psychiatric comorbidities were found in children with ADHD (90%). Thus, management of comorbidities as well as ADHD is required to obtain the best outcomes for the patients.

Keywords:

attention deficit hyperactivity disorder, children, psychiatric comorbidity

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Introduction

Attention deficit hyperactivity disorder (ADHD) is one of the most frequent psychiatric disorders of childhood [1]. The worldwide prevalence of ADHD has been reported to be 4–7% in children [2]. ADHD is most frequent disorder among school-age children, more common in boys, and its frequency decreases in further ages. Furthermore, most of the recent studies assume that ADHD is a life-long disorder [3].

Psychiatric disorders and social problems are likely to be present in a substantial proportion of ADHD children and this increases the severity of the clinical picture [4]. Oppositional defiant disorder (ODD) has been reported

to be one of the most frequent comorbidities in ADHD, with a rate reported between 20 and 80%. Other reported comorbidities include conduct disorder, depression, anxiety disorder, bipolar disorder, developmental disorders of learning, autism, tic disorder, and disorders of elimination [5]. The rate of comorbid diagnoses may vary according to the subtypes of ADHD, age groups, and sex.

Accordingly, in the current study, we aimed to determine the frequency of psychiatric comorbidities in a sample of children diagnosed with ADHD in El-Dakahlia Hospital of Mental Health and to assess the association between ADHD subtypes and the distribution of comorbid psychiatric disorders.

Participants and methods

This was as a cross sectional study carried out on 60 children aged between 6 and 12 years, of both sexes, diagnosed with ADHD according to the *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed., criteria. They were selected from the outpatient clinics of pediatric psychiatry at El-Dakahlia Hospital of Mental Health during the period from April 2015 to December 2015. Mental retardation or other major neurological and medical disorders were excluded.

After explaining the procedure and the purpose of the study, an informed consent was obtained from the patients' parents and a semistructured interview for collecting some demographic and clinical data was conducted with parents or caregivers of children with ADHD.

Conner's Parent Rating Scale-revised, long version [6], was applied to detect the core symptoms of ADHD, detect its subtypes, and assess severity. The Arabic versions of the Conner's rating scales revised, long versions, and parent form used in this study were translated and validated through previous research carried out by El Sheikh *et al.* [7] at the Institute of Psychiatry, Ain Shams University.

Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL) is a semistructured interview scale that is used to diagnose ADHD and its psychiatric comorbidities. Kaufman *et al.* [8] reported K-SADS-PL as a valid and reliable diagnostic tool. It was translated into Arabic language by Moussa *et al.*'s [9].

The intelligence quotient (IQ) was measured in all cases using the Wechsler Intelligence Scale for Children [10].

Statistical analysis

All data were collected, tabulated, and statistically analyzed using SPSS, 19.0, for Windows (SPSS Inc., Chicago, Illinois, USA) and MedCalc 13 for Windows (MedCalc Software bvba, Ostend, Belgium).

Quantitative data were expressed as the mean \pm SD and median (range) and qualitative data were expressed as absolute frequencies number and relative frequencies (percentage). Continuous data were checked for normality using the Shapiro-Walk test. Mann-Whitney *U* was used to compare two groups of non-normally distributed data. The one-way analysis of variance test was used to compare more than two groups of normally distributed data, whereas the Kruskal-Wallis *H*-test was used for non-normally distributed data. Percent of categorical variables was compared using the χ^2 -test.

All tests were two sided. *P*-value less than 0.05 was considered statistically significant, *P*-value less than 0.001 was considered highly statistically significant and *P*-value greater than or equal to 0.05 was considered nonstatistically significant.

Results

The demographic and clinical data of the studied group are shown in Table 1. The mean age of the cases was

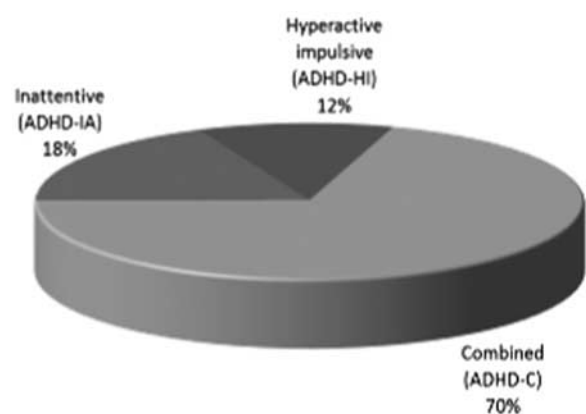
8.52 years, 44 (73.3%) males and 16 (26.7%) females; 23.3% of the cases had delayed language development, 6.7% had developmental problems in the form of delayed walking in three cases and delayed teeth eruption in one case, 11.7% had a positive family history of consanguinity, and 11.7% had a positive family history of psychiatric disorders including (anxiety in father, depression in mother, hyperactive father, neurotic parents, and over-protective parents). Eight (13.3%) cases had perinatal problems including difficult labor, respiratory problem, low birth weight, and intrauterine bleeding. The distribution of subtypes of ADHD according to Conner's Parent Rating Scale is shown in Fig. 1.

Table 1 Demographic and clinical data of the attention deficit hyperactivity disorder children studied

Demographic data	ADHD (N=60) [n (%)]
Age (years)	
Mean \pm SD	8.52 \pm 1.35
Median (range)	8.50 (6–12)
Sex	
Male	44 (73.3)
Female	16 (26.7)
Handness	
Left	8 (13.3)
Right	52 (86.7)
Language development	
Normal	46 (76.7)
Delayed	14 (23.3)
Developmental problems other than language	
Absent	56 (93.3)
present	4 (6.7)
History of consanguinity	
Absent	53 (88.3)
Present	7 (11.7)
Family history of psychiatric condition	
Absent	53 (88.3)
Present	7 (11.7)
Perinatal problem	
Absent	52 (86.7)
Present	8 (13.3)
Mother smoking	
Nonsmoker	42 (70)
Passive	14 (23.3)
Active	4 (6.7)

ADHD, attention deficit hyperactivity disorder.

Figure 1



Pie diagram showing the distribution of subtypes of attention deficit hyperactivity disorder (ADHD) according to Conner's Parent Rating Scale.

The distribution of subtypes of ADHD and IQ according to sex is shown in Table 2. There was no statistically significant difference between subtypes of ADHD according to sex ($P > 0.05$). Also, the mean IQ of male children was 96.50 ± 3.12 , which was similar to female children, who had a mean IQ of 96.75 ± 3.45 ; no significant difference was found ($P > 0.05$).

The prevalence of total psychiatric comorbidities according to the K-SADS-PL final diagnosis in ADHD cases is shown in Fig. 2. The total psychiatric comorbidity was present in 90% of children with ADHD included in the study. The most frequent psychiatric comorbidity was ODD, which was present in 55% of cases, followed by nocturnal enuresis in 33.3%, generalized anxiety disorder in 33.3%, depressive disorders in 16.7%, separation anxiety disorder in 15%, social phobia in 13.3%, motor tics in 11.7%, specific phobia in 10%, conduct disorder in 8.3%, Tourette disorder in 6.7%, panic disorder in 5%, and vocal tics in 1.7% of cases.

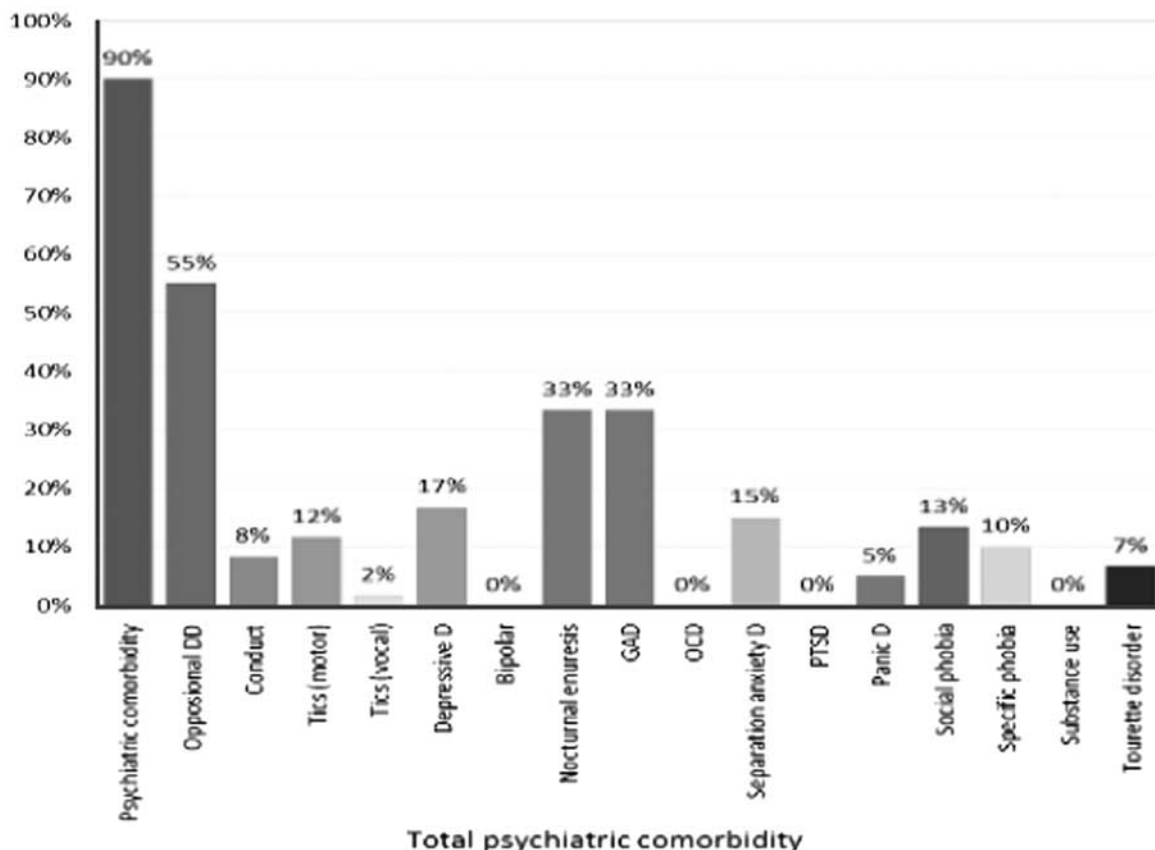
The prevalence of psychiatric comorbidity in the study group according to their sex is shown in Table 3. There was no statistically significant difference in the prevalence of psychiatric comorbidity in the study group according to sex ($P > 0.05$).

The prevalence of psychiatric comorbidities in the study group is shown in Table 4. There was no statistically significant difference in the prevalence of psychiatric comorbidity in cases of ADHD according to the subtype ($P > 0.05$), except for ODD and specific phobia. ODD was more frequent in children diagnosed with the ADHD-combined (ADHD-C) subtype (71.4%) compared with children with ADHD-inattentive (ADHD-IA) (27.2%) and children with the ADHD hyperactive/impulsive type (ADHD-HI) subtype (0%); a highly statistically significant difference was found ($P < 0.001$). Specific phobia was more frequent in children diagnosed with the ADHD-IA subtype (36.4%) compared with children with the ADHD-C subtype (4.8%); a statistically significant difference was found ($P < 0.05$).

The distribution of Conner's Parent Rating Scale, revised, and L results for male and female ADHD cases included in the study are shown in Table 5. No statistically significant differences were present in any of the items of Conner's parent rating scale-revised and long version in terms of sex ($P > 0.05$).

The relation between IQ and ADHD subtypes, depression, ODD, and conduct disorder among cases of ADHD was studied and it is shown in Table 6 that there was no significant difference between the three subtypes of

Figure 2



Bar chart showing the prevalence of total psychiatric comorbidity according to Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version final diagnosis in attention deficit hyperactivity disorder children. DD, defiant disorder; GAD, generalized anxiety disorder; OCD, obsessive compulsive disorder; PTSD, post-traumatic stress disorder.

Table 2 Distribution of subtypes of attention deficit hyperactivity disorder and intelligence quotient in attention deficit hyperactivity disorder cases according to sex

Subtypes of ADHD	Male (N=44) [n (%)]	Female (N=16) [n (%)]	Test	P-value (significance)
ADHD-IA	8 (18.2)	3 (18.8)	0.903 ^a	0.960 (NS)
ADHD-HI	5 (11.4)	2 (12.5)	0.915 ^a	0.903 (NS)
ADHD-C	31 (70.5)	11 (68.8)	0.916 ^a	0.899 (NS)
IQ				
Mean ± SD	96.50 ± 3.12	96.75 ± 3.45	-0.185 ^b	0.853 (NS)
Median (range)	97 (92–102)	96.5 (92–104)		
Interquartile range	5 (94–99)	5.5 (93.25–98.75)		

ADHD, attention deficit hyperactivity disorder; ADHD-C, ADHD-combined type; ADHD-HI, ADHD hyperactive/impulsive type; ADHD-IA, ADHD-inattentive; IQ, intelligence quotient.

^a χ^2 -Test.

^bMann-Whitney *U* test.

P < 0.05, significant.

Table 3 Prevalence of psychiatric comorbidity in attention deficit hyperactivity disorder cases according to sex

Psychiatric comorbidities	Male (N=44) [n (%)]	Female (N=16) [n (%)]	χ^2 -Test	P-value (significance)
Oppositional defiant	26 (59.1)	7 (43.8)	1.116	0.291 (NS)
Conduct	5 (11.4)	0 (0)	1.983	0.311 (NS)
Tics (motor)	5 (11.4)	2 (12.5)	0.015	1.000 (NS)
Tics (vocal)	1 (2.3)	0 (0)	0.370	1.000 (NS)
Depressive disorder	8 (18.2)	2 (12.5)	0.273	0.715 (NS)
Nocturnal enuresis	13 (29.5)	7 (43.8)	1.065	0.302 (NS)
GAD	17 (38.6)	3 (18.8)	2.088	0.148 (NS)
Separation anxiety	8 (18.2)	1 (6.3)	1.310	0.422 (NS)
Panic disorder	1 (2.3)	2 (12.5)	2.584	0.171 (NS)
Social phobia	3 (18.8)	5 (11.4)	0.554	0.429 (NS)
Specific phobia	2 (12.5)	4 (9.1)	0.152	0.653 (NS)
Tourette disorder	4 (9.1)	0 (0)	1.558	0.565 (NS)

GAD, generalized anxiety disorder.

P < 0.05, significant.

Table 4 Prevalence of psychiatric comorbidity in attention deficit hyperactivity disorder children according to its subtypes

Psychiatric comorbidities	ADHD-IA (N=11) [n (%)]	ADHD-HI (N=7) [n (%)]	ADHD-C (N=42) [n (%)]	χ^2 -Test	P-value
Oppositional defiant	3 (27.2)	0 (0)	30 (71.4)	17.586	<0.001 (HS)
Conduct	0 (0)	0 (0)	5 (11.9)	2.338	0.311 (NS)
Tics (motor)	1 (9.1)	1 (14.3)	5 (11.9)	0.120	0.942 (NS)
Tics (vocal)	0 (0)	0 (0)	1 (2.4)	0.436	0.804 (NS)
Depressive D	3 (27.3)	0 (0)	7 (16.7)	2.291	0.318 (NS)
Nocturnal enuresis	3 (27.3)	1 (14.3)	16 (38.1)	1.753	0.416 (NS)
GAD	3 (27.3)	0 (0)	17 (40.5)	4.646	0.098 (NS)
Separation anxiety disorder	3 (27.3)	0 (0)	6 (14.3)	2.552	0.279 (NS)
Panic disorder	1 (9.1)	1 (14.3)	1 (2.4)	2.265	0.322 (NS)
Social phobia	1 (9.1)	0 (0)	7 (16.7)	1.652	0.438 (NS)
Specific phobia	4 (36.4)	0 (0)	2 (4.8)	10.553	0.005 (S)
Tourette disorder	1 (9.1)	-	3 (7.1)	0.619	0.734 (NS)

ADHD, attention deficit hyperactivity disorder; ADHD-C, ADHD-combined type; ADHD-HI, ADHD hyperactive/impulsive type; ADHD-IA, ADHD-inattentive; GAD, generalized anxiety disorder; HS, highly significant; S, significant.

P < 0.05, significant.

ADHD in the IQ (*P* > 0.05). Also, there was no statistically significant relation between IQ and the presence of depression, ODD, and conduct disorder among the cases of ADHD (*P* > 0.05).

Discussion

In the present study, the diagnosis of ADHD was more common among boys (*n* = 44, 73.3%) compared with girls (*n* = 16, 26.7%). This finding is in agreement with previous studies carried out by Beshri *et al.* [11] and Amiri *et al.* [12], who found that male children have 2.5 and 5.6 times greater likelihood than female children to be diagnosed with ADHD within epidemiological samples.

In the current study, the most common ADHD subtype was ADHD-C (70%), followed by ADHD-IA (18.3%) and ADHD-HI (11.7%). This finding was in agreement with Amiri *et al.* [12], who carried out a study using K-SADS-PL and detected the ADHD-C type in 72.5% of ADHD children, ADHD-IA type in 18.1%, and ADHD-HI type in 9.4%. Another clinical-based study by Hergüner and Hergüner [13] reported that the frequency of ADHD-C type was 60.9%, ADHD-IA type was 36.1%, and ADHD-HI type was 3% in children with ADHD.

In the present study, on investigating the frequency of ADHD subtypes according to sex, no significant difference was found in the distribution of ADHD

Table 5 Distribution of Conner's Parent Rating Scale-revised, L results for male and female attention deficit hyperactivity disorder patients included in the study

Variables	Male (N=44)	Female (N=16)	Mann-Whitney U test	P-value (significance)
Hyperactivity				
Mean ± SD	71.09 ± 2.06	71.31 ± 2.15	-0.186	0.853 (NS)
Median (interquartile range)	71, 3.75 (69.25-73)	70.5, 3.75 (70-73.75)		
Anxious shy				
Mean ± SD	57.93 ± 1.24	58.43 ± 1.31	-1.344	0.179 (NS)
Median (interquartile range)	58, 2.0 (57-59)	59, 2.75 (57-59.75)		
Social problem				
Mean ± SD	64.54 ± 1.69	64.50 ± 1.89	-0.162	0.871 (NS)
Median (interquartile range)	64, 3 (63-66)	64, 3.5 (63-66.5)		
Oppositional				
Mean ± SD	65.68 ± 1.55	65.43 ± 1.50	-0.512	0.609 (NS)
Median (interquartile range)	65, 2 (65-67)	65, 2.75 (64.25-67)		
Emotional lability				
Mean ± SD	74.50 ± 1.45	74.18 ± 1.32	-1.371	0.170 (NS)
Median (interquartile range)	75, 2 (74-76)	74, 1.75 (73-74.75)		
Perfectionism				
Mean ± SD	56.15 ± 1.59	55.68 ± 1.44	-1.180	0.238 (NS)
Median (interquartile range)	56, 4 (54-58)	56, 2 (55-57)		
Psychosomatic				
Mean ± SD	57.04 ± 1.23	57.18 ± 1.55	-0.497	0.619 (NS)
Median (interquartile range)	57, 2 (56-58)	57.5, 2.75 (56-58.75)		
Cognitive problem/inattention				
Mean ± SD	66.54 ± 2.30	66.43 ± 1.67	-0.514	0.607 (NS)
Median (interquartile range)	66.5, 2 (65-67)	67, 3 (65-68)		
DSM-IV hyperactive-impulsive				
Mean ± SD	68.59 ± 6.36	68.37 ± 6.57	-0.211	0.833 (NS)
Median (interquartile range)	71, 3.75 (69.25-73)	70, 68 (25-73)		
DSM-IV inattentive				
Mean ± SD	69.90 ± 5.08	69.50 ± 5.17	-0.875	0.382 (NS)
Median (interquartile range)	73, 2 (70-72)	71, 2 (70-72)		
DSM-IV total				
Mean ± SD	71.27 ± 2.03	71.75 ± 2.54	-0.917	0.35(NS)
Median (interquartile range)	71, 2 (70-72)	72, 3 (70-73)		
Conner's ADHD index				
Mean ± SD	71.95 ± 1.56	71.68 ± 1.74	-0.437	0.662 (NS)
Median (interquartile range)	72, 2.75 (70.25-73)	71.5, 3 (70-73)		
CGI				
Mean ± SD	73.40 ± 2.22	74.06 ± 2.29	-0.987	0.324 (NS)
Median (interquartile range)	73, 3.75 (71.25-75)	74.5, 3 (73-76)		
CGI restlessness-impulsive				
Mean ± SD	69.97 ± 2.14	70.12 ± 1.20	-0.878	0.380 (NS)
Median (interquartile range)	70, 1.75 (69-70.75)	70, 2 (69-71)		

ADHD, attention deficit hyperactivity disorder; CGI, Conners Global Index; DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. $P > 0.05$, NS.

subtypes between boys and girls ($P > 0.05$). Our finding was in agreement with Ghanizadeh [5], who found no difference between boys and girls in terms of the prevalences of ADHD subtypes. In contrast to our finding, Yüce *et al.* [14] found that ADHD-IA type was significantly more common in the girls than the boys (36 vs. 7.2%). Another study by Amiri *et al.* [12] reported that ADHD-C type was more common in boys (63.8%) than girls (36.2%). This difference may be depending on whether the study was population-based or clinical-based. Other factors such as study population, culture, diagnostic tools, and recruitment criteria may account for this difference.

In the present study, we found that 90% of ADHD children had at least one psychiatric comorbidity according to the K-SADS-PL scale. This finding was in agreement with a previous cross sectional study carried out by Yüce *et al.* [14], who found that 96.3% of ADHD children admitted to the pediatric psychiatry outpatient clinic had at least one psychiatric comorbidity using the K-SADS-PL scale. Another study by Hergüner and

Hergüner [13] found that 73.7% of ADHD children had at least one psychiatric comorbidity using K-SADS-PL, whereas Amiri *et al.* [12] reported psychiatric comorbidities in 62.5% of ADHD children. Other studies carried out on ADHD children using different scales had reported a lower rate of comorbidity. Wijetunge *et al.* [15] reported that 69.5% of ADHD children had a neuropsychiatric comorbidity.

The high percentage of the presence of comorbid disorders in the present study may be associated with the study method. It can be assumed that various psychiatric disorders can be evaluated with K-SADS-PL in more detail. It has been reported that the clinical group has more comorbidities compared with the general population [12].

In the present study, the most frequently reported psychiatric comorbidity in ADHD children was ODD (55%), followed by comorbid nocturnal enuresis (33.3%), generalized anxiety disorder (33.3%), depressive disorders (16.7%), and separation anxiety disorder (15%). Accordingly, ODD was the most frequent comorbidity in

Table 6 Relation between intelligence quotient and attention deficit hyperactivity disorder subtypes , depression, oppositional defiant disorder, and conduct disorder among cases of attention deficit hyperactivity disorder

ADHD subtypes	IQ		Test	P-value (significance)
	Mean \pm SD	Median (range)		
ADHD subtypes				
ADHD-IA (N=11)	96.36 \pm 2.76 5 (93–98)	97(92–101)	0.577 ^a	0.750 (NS)
ADHD-HI (N=7)	95.85 \pm 1.95 4 (94–98)	96 (93–98)		
ADHD-C (N=42)	96.73 \pm 3.47 6.25 (93.75–100)	97.5 (92–104)		
Depression				
Absent (N=50)	96.68 \pm 3.20 5 (94–99)	97 (92–104)	– 0.668 ^b	0.504 (NS)
Present (N=10)	96 \pm 3.16 6.25 (92–98.25)	97.50 (92–100)		
Oppositional defiant disorder				
Absent (N=27)	96.48 \pm 3.33 5 (94–99)	96 (92–104)	– 0.276 ^b	0.782 (NS)
Present (N=33)	96.63 \pm 3.11 5.5 (93.5–99)	98 (92–102)		
Conduct disorder				
Absent (N=55)	96.76 \pm 3.16 5 (94–99)	97 (92–104)	– 1.734 ^b	0.083 (NS)
Present (N=5)	94.40 \pm 2.88 5.5 (92–97.5)	93 (92–98)		

ADHD, attention deficit hyperactivity disorder; ADHD-C, ADHD-combined type; ADHD-HI, ADHD hyperactive/impulsive type; ADHD-IA, ADHD-inattentive; IQ, intelligence quotient.

^aKruskal–Wallis *H* test.

^bMann–Whitney *U* test.

P < 0.05, significant.

ADHD children, with a rate of 55%. This finding was in agreement with Elia *et al.* [16]; Yüce *et al.* [14]; and Amiri *et al.* [12], who reported high but various prevalences of ODD in ADHD children: 40, 69.4, and 29.4%, respectively. In most studies, ODD has been the most common comorbidity in ADHD children. However, our finding was not consistent with Riahi *et al.* [17], who found that nocturnal enuresis was the most common comorbid disorder in children with ADHD (58.7%), followed by anxiety disorders (48.3%) and obsessive compulsive disorder (47.45%). Also, Wijetunge *et al.* [15] found that specific developmental disorder of scholastic skills was the most prevalent comorbidity in ADHD children. The discrepancies between our finding and their finding may be because of the differences in the age groups of selected samples and the instruments and diagnostic criteria used to assess ADHD and comorbid psychiatry disorders.

In the present study, nocturnal enuresis was the second common disorder in children with ADHD (33.3%). Amiri *et al.* [12] reported enuresis in 17.5% of ADHD children. Yüce *et al.* [14] reported elimination disorders in 27.8% of ADHD cases; these were more frequent in children than in adolescents (37.1 vs. 10.5%). Comorbidity between enuresis and ADHD could either be because of common etiologic pathways underlying these two conditions or because of causal relations in which the nonresolution or treatment of one disorder increases the risk for the other disorder [18].

In the present study, generalized anxiety disorder was another second common disorder in ADHD children (33.3%), followed by separation anxiety disorder in 15%,

social phobia in 13.3%, specific phobia in 10%, and panic disorder in 5%. This was in agreement with different studies that have shown high but various prevalences of anxiety disorders in patients with ADHD. The prevalence of anxiety disorders in ADHD children was 44% in a study by Habrani and Bahdani [19], 42.9% in Yüce *et al.*'s [14] study, 27.5 % in Chutko *et al.*'s [20] study, and 48.3% in a study by Riahi *et al.* [17]. Therefore, anxiety disorders are common problems in children with ADHD that may affect its treatment. It was reported that more than 52% of patients with ADHD have more than two anxiety disorders; thus, anxiety symptoms should be examined carefully in ADHD [14].

It has been reported that the presence of conduct disorders in ADHD is associated with more severe symptoms and that the risk for antisocial personality disorder, substance abuse, and addiction is increased in these cases [21]. In the present study, the rate of conduct disorder was found to be low at 8.3%. This result was in agreement with Ghanizadeh [5], who reported conduct disorder in 9.9% of ADHD children. Comorbidity of ADHD and conduct disorder was reported to affect 25% in children and 42% in adolescents. 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 higher in this group [22].

In the present study, a low rate of comorbid depressive disorder (16.7%) was present in the studied group. This could be explained by the younger age group of selected children in our study (6–12 years). It was reported that the diagnosis of depression is 2.5 times more frequent during adolescence and early adulthood [23]. Also, the low frequency of mood disorders in the present study may

be a consequence of cultural differences as parents in our clinical sample might have reported mood symptoms of their children to a lesser extent than inattention, hyperactivity, aggression, and impulsive behavior. No bipolar disorder was detected in our study. It seems that children had more bipolar disorders with growing up to the adolescence.

In the present study, no significant difference was found in the prevalence of any psychiatric comorbidity according to the sex of the studied sample, which was in agreement with other studies by Habrani and Bahdani [19], Salehi *et al.* [24], and Amiri *et al.* [12], who did not find sex-related differences in the prevalence of any psychiatric comorbidity. In contrast to this finding, a study by Yüce *et al.* [14] found that depressive and anxiety disorders were more frequent in girls than in boys.

With respect to the prevalence of comorbidity according to ADHD subtypes in the present study, there was no significant difference, except for ODD and specific phobia. A higher frequency of ODD in ADHD-C type was present compared with ADHD-IA and ADHD-HI types, with a highly statistically significant difference (71.4 vs. 27.2% and 0%, respectively, $P < 0.001$). These results were similar to those reported by Elia *et al.* [16] and Amiri *et al.* [12], who found a higher frequency of ODD in ADHD-C type, but not similar in the other subtypes, which may be because of difference in the study methods and selection of the participants from the general population or patients attending clinics.

In the present study, the frequency of specific phobia was more common in ADHD-PI type (36.4%). This finding was similar to Amiri *et al.* [12], who reported a higher frequency of specific phobia (34.5%) in ADHD-IA subtype in ADHD children. Yüce *et al.* [14] reported a higher frequency of social phobia in ADHD-IA type (60%). In contrast, Elia *et al.* [16] reported that minor depression and dysthymia were the most common comorbidities in ADHD-IA type (20.8%). This difference may be because of differences in study methods, the age groups of the selected patients, and selection of the participants from the general population or patients attending clinics.

In the present study, the mean IQ of ADHD children was 96.56 ± 3.18 , which was within the normal average, without a statistically significant difference between males and females (male children showed a mean IQ of 96.50 ± 3.12 similar to female children, who showed a mean IQ of 96.75 ± 3.45 ; $P = 0.853$). No statistically significant correlation was present between IQ and the different subtypes of ADHD. It has been reported that children with ADHD tend to have an ~9-point lower IQ score than children without the diagnosis [25]. Nevertheless, the literature shows the possibility of having both ADHD and high IQ, which is a topic of some controversy [26].

There was no statistically significant correlation between IQ and depression among the ADHD children studied, a result that could be explained by the fact that depression could be experienced by children with whatever level of

intelligence and should be looked for and to be managed properly. For ODD and conduct disorder, there was no significant correlation between IQ and both ODD and conduct disorder in the present study. This was in agreement with the literature, which found that the associations between ratings of conduct problems and intelligence in children are often small or even non-significant [27,28].

The presence of comorbid disorders requires special consideration in the treatment of patients with ADHD. There seems to be a direct relationship between the severity of the illness and the comorbid disorder. It has been observed that patients with ADHD and a comorbid disorder appear to have more severe ADHD symptoms with problems in diagnosis and treatment, and hence both disorders have to be diagnosed and treated simultaneously [29].

The discrepancies between our results in the present study and those in previous studies may be because of some factors including the site of sample selection from different general and clinical populations, the age groups of the selected sample, exclusion criteria, and the instruments and diagnostic tools used to assess ADHD and comorbid psychiatric disorders.

Conclusion

ADHD children should be investigated properly for the presence of accompanying psychiatric comorbidities. ODD, nocturnal enuresis, and anxiety disorders were the most prevalent comorbidities. Conduct disorder, tic, and depressive disorders also accompanied ADHD. Early treatment and multidimensional interventions are recommended to obtain the best outcomes for the patients.

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Conflicts of interest

There are no conflicts of interest.

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