

Original Article

Psychiatric Comorbidities in ADHD Children: An Iranian Study among Primary School Students

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Abstract

Background: This study was performed to determine the lifetime prevalence of psychiatric disorders concomitant with attention deficit/hyperactivity disorder (ADHD) among primary school students.

Methods: One thousand six hundred fifty-eight primary school students (781 females and 877 males) were selected in a cluster random manner in 2010. The first screening was performed by the Conner's teacher rating scale revised and Teacher ADHD rating scale-IV and then the students, in whom the ADHD was diagnosed by a child and adolescent psychiatrist according to DSM-IV-TR, were evaluated by K-SADS-PL semi-structured interview to detect the psychiatric comorbidities.

Results: The prevalence of psychiatric comorbidities in ADHD subjects was 62.5 %. Oppositional defiant disorder (29.4 %), specific phobia (21.9 %), and enuresis (17.5 %) were the most common co-morbidities. The most common comorbidities in ADHD-IA (inattentive type) (n = 29) were specific phobia (34.5 %), oppositional defiant disorder (20.7 %), chronic motor tic disorder (17.2 %), and enuresis (17.2 %). The most common comorbidities in ADHD-HI (hyperactive/impulsive type) (n = 15) were chronic motor tic disorder (33.3 %), oppositional defiant disorder (26.7 %), and specific phobia (26.7 %). The most common comorbidities in ADHD-C (combined type) (n = 116) were oppositional defiant (31.9 %), enuresis (19 %), and specific phobia (18.1 %). The frequency of chronic vocal tic disorder was higher in ADHD-HI compared with ADHD-C (P = 0.01).

Conclusion: The results of this study indicated that the frequency of other psychiatric comorbidities in primary school students with ADHD is high that may affect disease course and treatment. Hence, evaluation for other comorbidities in ADHD patients should be considered.

Keywords: Attention deficit hyperactivity disorder (ADHD), children, comorbidity, Iran, students

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Introduction

Attention deficit/hyperactivity disorder (ADHD) is a common problem among children accounting for 50 % of those attending to child psychiatry clinics.¹ The symptoms of this disorder include attention deficit, hyperactivity, and impulsivity that result in numerous problems at home, school, and social conditions leading to dysfunction in individual and family life of the patients.² The prevalence of ADHD in school-age children is reported to be 5.29 % and there is no significant difference in the prevalence in different geographic regions.^{3,4}

It is seen that more than 50 % of ADHD patients suffer from psychiatric comorbidities^{5,6} and this problem is often continued to adulthood ages.⁷ Review of the current literature shows that about 36 % to 40 % of ADHD subjects have oppositional defiant disorder,⁸⁻¹⁰ 10 % to 11 % conduct disorder,^{8,9} 4 % to 21 % depression,⁸⁻¹⁰ and 15 % to 25 % have anxiety.⁸⁻¹⁰

There is compelling evidence that ADHD comorbidities would

affect the presentation and clinical severity, long-term prognosis, and therapeutic response of disease.¹¹ For example, in presence of communicative disorder concomitant with ADHD, this comorbidity would deteriorate the ADHD symptoms and increase aggressive behaviors and anxiety and result in lack of intimate relationships.^{12,13} Also, some studies have shown that anxiety comorbidity in ADHD patients is a cause of poor therapeutic response to psycho-stimulant medications.¹⁴

The psychiatric studies are affected by geographic conditions and research methods. Of these, using diagnostic instruments may originate some controversies about the results of the studies on ADHD psychiatric comorbidities. Other factors affecting the related studies include the findings regarding current or lifespan ADHD comorbidities, as well as selected sample population.¹⁰ For example; some studies have used the clinical⁹ or specific samples.¹⁵ It seems that the implementation of more individual diagnostic tools among ADHD patients and recruitment from general populations at large would lead to more congruent results.

This study was performed to determine the lifetime prevalence of psychiatric disorders concomitant with ADHD among primary school students in Iran.

Subjects and Methods

This was as a descriptive-analytical study. One hundred thousand four hundred eleven primary school students (51189 males and

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Table 1. Prevalence of lifetime psychiatric disorder according to gender

Gender* disorders	Female (N %)		Male (N %)		Total (N %)	Fisher exact test	
	Yes	No	Yes	No		χ^2	P
Oppositional defiant disorder	20 (30.8)	45 (69.2)	27 (28.4)	68 (71.6)	47 (29.4)	0.10	NS
Specific phobia	18 (27.7)	47 (72.3)	17 (17.9)	78 (82.1)	35 (21.9)	2.16	NS
Enuresis	11 (16.9)	45 (83.1)	17 (17.9)	78 (82.1)	28 (17.5)	0.02	NS
Chronic motor tic disorder	8 (12.3)	57 (87.7)	18 (18.9)	77 (81.1)	26 (16.3)	1.25	NS
Separation anxiety disorder	4 (6.2)	61 (93.8)	8 (8.4)	78 (91.6)	12 (7.5)	0.28	NS
MDD	5 (7.7)	60 (92.3)	5 (5.3)	90 (94.7)	10 (6.3)	0.38	NS
Social phobia	6 (9.2)	59 (90.8)	3 (3.2)	92 (96.8)	9 (5.6)	2.68	NS
GAD	3 (4.6)	62 (95.4)	6 (6.3)	89 (93.7)	9 (5.6)	0.21	NS
Transient motor tic	4 (6.2)	61 (93.8)	5 (5.3)	90 (94.7)	9 (5.6)	0.05	NS
Tourette disorder	4 (6.2)	61 (93.8)	4 (4.2)	91 (95.8)	8 (5)	0.30	NS
Chronic vocal tic disorder	1 (1.5)	64 (98.5)	5 (5.3)	90 (94.7)	6 (3.8)	1.48	NS
OCD	1 (1.5)	64 (98.5)	5 (5.3)	90 (94.7)	6 (3.8)	1.48	NS
PTSD	1 (1.5)	64 (98.5)	5 (5.3)	90 (94.7)	6 (3.8)	1.48	NS
Conduct disorder	1 (1.5)	64 (98.5)	3 (3.2)	92 (96.8)	4 (2.5)	0.41	NS
Dysthymic disorder	1 (1.5)	64 (98.5)	2 (2.1)	93 (97.9)	3 (1.9)	0.06	NS
Acute stress disorder	1 (1.5)	64 (98.5)	1 (1.1)	94 (98.9)	2 (1.3)	0.07	NS
Transient vocal tic disorder	1 (1.5)	64 (98.5)	1 (1.1)	94 (98.9)	2 (1.3)	0.07	NS

*MDD: Major depressive disorder; GAD: Generalized anxiety disorder; OCD: Obsessive- compulsive disorder; PTSD: Post-traumatic stress disorder.

Table 2. Prevalence of lifetime psychiatric disorder according to ADHD type

Subtypes disorders	Combined (n = 116)		IA (n = 29)		HI (n = 15)		Fisher exact test	
	Yes (N %)	No (N %)	Yes (N %)	No (N %)	Yes (N %)	No (N %)	χ^2	P
Specific phobia	21 (18.1)	95 (81.9)	10 (34.5)	19 (65.5)	4 (26.7)	11 (73.3)	3.8	NS
Social phobia	6 (5.2)	110 (94.8)	2 (6.9)	27 (93.1)	1 (6.7)	14 (93.3)	0.16	NS
GAD	7 (6)	109 (94)	2 (6.9)	27 (93.1)	0	15 (100)	1.01	NS
Separation anxiety disorder	7 (6)	109 (94)	2 (6.9)	27 (93.1)	3 (20)	12 (80)	3.7	NS
PTSD	3 (2.6)	113 (97.4)	2 (6.9)	27 (93.1)	1 (6.7)	14 (93.3)	1.5	NS
Acute stress disorder	0	116 (100)	1 (3.4)	28 (96.6)	1 (6.7)	14 (93.3)	6.1	< 0.5
OCD	5 (4.3)	111 (95.7)	1 (3.4)	28 (96.6)	0	15 (100)	6.9	NS
MDD	5 (4.3)	111 (95.7)	4 (13.8)	25 (86.2)	1 (6.7)	14 (93.3)	3.5	NS
Disthymic	2 (1.7)	114 (98.3)	1 (3.4)	28 (96.6)	0	15 (100)	0.69	NS
Oppositional defiant disorder	37 (31.9)	79 (68.1)	6 (20.7)	23 (79.3)	4 (26.7)	11 (73.3)	1.4	NS
Conduct disorder	4 (3.4)	112 (96.6)	0	29 (100)	0	15 (100)	1.5	NS
Tourette disorder	5 (4.3)	111 (95.7)	1 (3.4)	28 (96.6)	2 (13.3)	13 (86.7)	2.4	NS
Chronic motor tic disorder	16 (13.8)	100 (86.2)	5 (17.2)	24 (82.8)	5 (33.3)	10 (66.7)	3.7	NS
Chronic vocal tic disorder	2 (1.7)	114 (98.3)	1 (3.4)	28 (96.6)	3 (20)	12 (80)	12.3	< 0.01
Transient motor tic	8 (6.9)	108 (93.1)	0	29 (100)	1 (6.7)	14 (93.3)	2.1	NS
Transient vocal tic disorder	2 (1.7)	114 (98.3)	0	29 (100)	0	15 (100)	0.76	NS
Enuresis	22 (19)	94 (81)	5 (17.2)	24 (82.8)	1 (6.7)	14 (93.3)	1.3	NS

IA: Inattentive, HI: Hyperactive/Impulsive.

49222 females) of Tabriz, Iran from the five educational districts of the city were participated in the study in 2010. Two-stage cluster sampling method was used to select the subjects. Therefore, three male and three female schools were selected randomly from each district. Then, two classes from each school were chosen and all the included students were studied. In total, 1658 students (781 girls and 877 boys) from 60 classes were selected. Teachers were asked to assess the ADHD symptoms by completing Conners' Teacher Rating Scale (CTRS) and the ADHD Rating Scale. The 216 students who screened were interviewed by a child and adolescent psychiatrist according to DSM-IV-TR diagnostic criteria and ultimately 160 children were diagnosed as ADHD. Then, both children with ADHD and their parents underwent K-SADS-PL

semi-structured diagnostic interview for diagnosis of psychiatric comorbidities.

Diagnostic tools

Conners' Teacher Rating Scale (CTRS)

The revised CTRS includes 28 items to diagnose the core symptoms of ADHD and some co-morbidities such as oppositional defiant disorder in the age range of three to 17 years. Answers were scored based on a four-scale Lickert method. The scale is available in parents, teacher, and adults' self-report forms. The revised CTRS has a good sensitivity and specificity. The obtained results from this scale are valid as reported by Dereboy¹⁶ and its internal validity is shown to be more than 0.90.

Persian version of CTRS has frequently used in several Iranian studies.¹⁷ Testing-retesting reliability and Cronbach's alpha reliability was 0.76 and 0.86, respectively.¹⁸

The ADHD rating scale (ADHD-RS)

The ADHD-RS includes 18 items that each shows one ADHD symptom according to DSM-IV-TR criteria. It may be used for age range of five to 18 years and is useful for differentiation of ADHD and healthy children and differentiates attention deficit symptoms from hyperactivity and impulsivity symptoms. It was used to differentiate various types of ADHD in this study. The validity of English version of ADHD-RS is approved.¹⁹ The ADHD-RS-IV has been used extensively in Iran and offers valid measurement of attention and behavioral problems in school-age children.²⁰⁻²² The reliability of ADHD-RS was 0.81 using Cronbach's alpha in this study. We used these two instruments for screening so as to increase accuracy and decrease the false negative or positive cases. For this, we recruited only the subjects who had the same positive results for ADHD based on CTRS and ADHD-RS simultaneously.

K-SADS-PL semi-structured diagnostic interview

This questionnaire is a semi-structured diagnostic interview designed according to DSM-IV criteria and is fulfilled via interview with parents and child by a psychiatrist. K-SADS-PL has a proper capability to diagnose mood, anxiety, behavioral, and other psychiatric disorders. Ghanizadeh and colleagues⁹ have reported the test-retest reliability of Persian version of this questionnaire to be 0.81 and the inter-rater reliability with 0.69 in which the sensitivity and specificity of Persian version of K-SADS is shown to be high. The K-SADS-PL was used to diagnose ADHD and its psychiatric comorbidities. In the current study, all of the lifespan-related psychiatric diagnoses were considered.

Statistical methods

The obtained data were analyzed by SPSS software version 13. The descriptive statistics (frequency, %, mean, and standard deviation) were used to describe the epidemiologic characteristics and the prevalence of diseases. Chi-square and Fisher exact tests were applied to compare the frequencies. In this study, P-values less than 0.05 were considered significant.

Results

Out of 1658 selected primary school students, 781 (47.1 %) were females and 877 (52.9 %) were males; all aged seven to twelve years. According to CTRS and ADHD-RS, 216 students (13.5 %) were considered for psychiatric interview. Finally, 160 subjects (9.7 %) were diagnosed to have ADHD after interview by a child and adolescent psychiatrist according to DSM-IV-TR. The mean age of ADHD children was 9.26 ± 1.14 years.

The ADHD was more common among boys ($n = 95$, 12.2 %) compared with girls ($n = 65$, 7.4 %). The frequencies of ADHD combined type, ADHD inattentive type (ADHD-IA), and ADHD hyperactive/impulsive type (ADHD-HI), were 116 (72.5 %), 29 (18.1 %), and 15 (9.4 %), respectively.

Combined ADHD was more common in boys ($n = 74$, 63.8 %) than girls ($n = 42$, 36.2 %). The results revealed that 10 boys (34.5 %) and 19 girls (65.5 %) had ADHD-IA. In addition, 11 male students (73.63 %) and four female ones (26.7 %) were diagnosed

as ADHD-HI.

One hundred out of 160 ADHD patients (62.5 %) had a psychiatric comorbidity. According to chi-square test, the frequency was one in 26 children (16.3 %), two in 36 subjects (22.5 %), and three or four comorbid disorders in 38 students (23.8 %) with no sex differences ($\chi^2 = 1.91$, $P < 0.05$).

The most common psychiatric comorbidities included oppositional defiant disorder in 47 subjects (29.4 %), specific phobia in 35 children (21.9 %), enuresis in 28 students (17.5 %), and chronic motor tic disorder in 26 subjects (16.3 %). According to the Fisher exact test there was no significant difference on comorbidities between girls and boys (Table 1).

The most common findings in ADHD-HI type were chronic motor tic disorder in five children (33.3 %), oppositional defiant in four students (26.7 %), and specific phobia in four subjects (26.7 %). The most common findings in ADHD-IA type were specific phobia seen in 10 subjects (34.5 %), oppositional defiant in six students (20.7 %), chronic motor tic disorder in five children (17.2 %), and enuresis in five children (17.2 %). The same findings in ADHD- combined type were oppositional defiant in 37 students (31.9 %), enuresis in 22 children (19 %), and specific phobia in 21 subjects (18.1 %).

According to chi-square test the frequency of chronic vocal tic disorder was higher in hyperactive-impulsive type of ADHD compared with other type ($\chi^2 = 12.3$, $P < 0.01$).

Discussion

The current study showed that ADHD is a common problem among students in Tabriz, Iran with a prevalence rate of 9.7% in primary school students with an especially higher rate of ADHD among boys compared with girls (12.2 % versus 7.4 %) which is compatible with another study conducted on an Iranian population.²³ This finding is similar to those reported by Bener, et al.²⁴ showing a 9.4 % rate for ADHD, but the sex difference was more significant in their study (14.1 % in boys and 4.4 % in girls). Also, in a study in Italy by Mugnaini, et al.²⁵ ADHD prevalence was reported as 7.1% with a higher rate in boys than girls (10.4 % versus 1.3 %). In a Nigerian study on 1112 primary school students (six to 12 years old) the prevalence of ADHD was reported to be 7 % – 8 % with a male to female ratio of two to one.²⁶ Suvarna and Kamath²⁷ in Nepal reported a total prevalence rate of 12.2 %, male and female prevalence of 19 % and 5.8 %, respectively. Smalley, et al.²⁸ similarly reported a childhood prevalence of 12.6 %.

Several studies demonstrate a high prevalence of ADHD in primary school children and male predominance with different rates. Nevertheless, factors like as ethnicity, culture, study population, diagnostic tools, and recruitment criteria may account for this discrepancy.

Our results showed that 37.5 % of the patients had no psychiatric comorbidity. In a study by Elia, et al.¹⁰ 33.5 % of patients with ADHD had no psychiatric comorbidity. In addition, a study in Sweden revealed that 23 % of children with ADHD had no psychiatric comorbidity.²⁹ These variations may be due to selection of cases from different healthy and clinical populations with different exclusion criteria. Many researchers, however, believe that two-third of ADHD patients have psychiatric comorbidity.¹⁰

Our findings showed that oppositional defiant disorder is the most common disorder in ADHD children (29.4 %) and is common in all types. Hence, oppositional defiant disorder and ADHD

are two related entities. Different studies have shown a high but various prevalence of oppositional defiant disorder in ADHD. In Elia, et al.'s study¹⁰ 40 %, in Souza, et al.'s study³⁰ 39 %, and in Byun, et al.'s study³¹ 50.5 % of ADHD patients were reported to have oppositional defiant disorder. In most studies such as Kadesjö and Gillberg's study,²⁹ the oppositional defiant disorder has been the most common comorbidity in ADHD children. In studies in which clinical samples were used, the prevalence was reported to be high.³¹ However, in studies with sample volume selected from general population the reported prevalence has been lower. Bauermeister, et al.⁸ showed this difference with selection of patients from both general and clinical samples (50.5 % versus 24.5 %).

According to our findings the total prevalence of anxiety disorders in ADHD children was 42 % in which the most common type was specific phobia. The prevalence of anxiety disorder in ADHD patients in Rio de Janeiro was 30.8 % and in Porto Alegre was 24.2 %.³⁰ Bauermeister, et al.⁸ reported a rate of 24.43 % and 31.5 % in general and clinical samples, respectively. Another study reported a prevalence rate of 26.5 % in a cohort study in Finland.²⁸ So the anxiety disorder is a common problem in ADHD children that may affect the treatment of ADHD.

Although it was shown that risks of comorbidity of conduct disorder and oppositional defiant disorder are higher among boys compared with girls in both clinical and general samples,³² our study showed no sex difference in the prevalence of any psychiatric comorbidity which are in congruence with a study performed in Iran.³³ Accordingly, the ADHD is a major problem in girls as well as boys resulting in disturbance in different functional aspects. The comorbidity risk similarity among girls and boys shows more similarities in other features such as prognosis and clinical response. Therefore, the question may be arisen whether ADHD and sex are two independent risk factors for psychiatric comorbidity in ADHD.

We found that the most common psychiatric comorbidities were chronic motor tic disorder (33.3 %), specific phobia (34.5 %), and oppositional defiant disorder (31.9 %) in ADHD- HI type, ADHD- IA type, and in ADHD- C type, respectively.

Elia, et al.¹⁰ showed that the most common psychiatric comorbidities were oppositional defiant disorder (41.9 %), minor depression and dysthymia (20.8 %), and oppositional defiant disorder (50.7 %) in ADHD-HI type, ADHD-IA type, and in ADHD-C type, respectively. Our results were similar to those reported by Elia, et al.¹⁰ and Byun, et al.³¹ about higher frequency of oppositional defiant disorder in ADHD-C type. However, in the other subtypes the results were not similar that may be due to difference in study methods and selection of the subjects from general population or clinic attending subjects. We also evaluated bipolar comorbidity in ADHD subjects through the study but the results showed that there was no comorbidity like a UK sample of children with ADHD.³⁴ The ones that reported ADHD-BMD comorbidities mostly have done research on the adolescent populations. It seems that children manifest more bipolarity with growing up to the adolescence.

High prevalence of ADHD and also psychiatric comorbidities among ADHD subjects recall the need to treatment and multidimensional interventions. Also, increasing the knowledge level of families may be effective in treatment of this disorder especially the oppositional defiant disorder that may develop numerous problems in communicative function of students. Like all studies, ours has limitations that must be considered, including ascertain-

ment issues.

The prevalence of ADHD was 9.7 % (160 subjects). The frequency of ADHD was higher in boys.

Sixty-two point five percent of primary school students with ADHD had psychiatric comorbidity. Oppositional defiant disorder (29.4 %), specific phobia (21.9 %), enuresis (17.5 %), and chronic motor tic disorder (16.3 %) were the most common psychiatric comorbidities in ADHD children. Chronic motor tic disorder, oppositional defiant disorder, and specific phobia were related to hyperactive-impulsive type, combined type, and inattentive type of ADHD, respectively that recall the need to specific attention in treatment. Age variant plays an important role in determining the prevalence of a psychiatric disorder. In our study, the target population was limited to the students of primary schools. Also, inhibition of students' behaviors due to school orders may affect on the teachers' assessments so that only severe cases could attract their attentions. For the next studies, parents' assessment at homes is suggested.

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Conflict of interest: *The authors declare that they have no competing interests.*

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