



The severity of attention deficit hyperactivity symptoms and its relationship with lifetime substance use and psychological variables among 10th grade students in Istanbul

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Abstract

Aim: The aim of this study was to determine the severity of attention deficit hyperactivity symptoms (ADHS) and related psychological and behavioral variables among 10th grade students in Istanbul/Turkey.

Methods: Cross-sectional online self-report survey conducted in 45 schools in 15 districts Istanbul. The questionnaire included sections about demographic data and use of substances including tobacco, alcohol and drugs. Also ADHS, depression, anxiety, anger and sensation seeking subscales of Psychological Screening Test for Adolescents (PSTA) were used. The analyses were conducted based on the 4938 subjects.

Results: Mean ADHS score was higher in females and among those with a lifetime use of tobacco, alcohol and drug, and having self-harming behavior and suicidal thoughts. ADHS score was correlated with depression, anxiety, anger and sensation seeking scores. In univariate covariance analysis (ANCOVA); depression, anxiety, anger, sensation seeking, lifetime alcohol use and suicidal thoughts predicted the severity of ADHS.

Conclusions: The findings suggest that, since ADHS is associated with depression, anxiety, anger, sensation seeking, lifetime alcohol use and suicidal thoughts among 10th grade students, clinicians should screen suicidality and comorbid psychiatric symptoms routinely in adolescents with ADHS.

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1. Introduction

1.1. Attention deficit hyperactivity disorder

Attention deficit hyperactivity disorder (ADHD) is a chronic neurobiological disorder with childhood onset and persistence into adolescence and adulthood [1]. According to sample selection and diagnostic criteria, the prevalence rate of ADHD in children ranges from 3% to 7% [2]. Although adolescents with ADHD have less severe hyperactivity symptoms, they exhibit more mental comorbidity, school problems, and risky behaviors along with lower self-esteem than children with ADHD [3]. Nevertheless, adolescents

may experience attention deficit hyperactivity symptoms (ADHS), such as elevated levels of inattention, hyperactivity, and impulsivity compared with their peers, which may not reach diagnostic level of ADHD [4]. A recent study indicated that severity of ADHS is associated with high school dropout rates [5].

It is a well known fact that ADHD has several comorbidities and risk situations, which suggest that awareness and adequate treatment of this disorder is important. The rates of comorbidities in ADHD, such as bipolar disorder, depression, anxiety, oppositional defiance, conduct and substance use disorders (SUD) are high [6–10]. If these disorders are not recognized by clinicians in early ages, the presence of these comorbidities, particularly SUD, can also occur in adulthood [11–13]. A previous study suggested that ADHD is a significant precursor of subsequent disorders in children and further research is required to lessen the risk for substance use in this population [14].

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1.2. Relationship between attention deficit hyperactivity symptoms and substance use

Previous studies showed that not only the rate of adolescents with lifetime substance use is higher in those with ADHD than in those without ADHD [11] but also the proportion of adolescents with ADHD is high among those with lifetime substance use [15]. This suggests a strong relationship between ADHD and lifetime substance use [11,13,14]. Previous studies suggested that childhood ADHD increases the risk of developing SUD and nicotine dependence in adolescence [11,13]. Although the pattern and type of substance use may differ between western and eastern countries, because of cultural background and drug availability, the relationship between ADHD and SUD in an Iranian sample was found to be similar with western countries [12]. In this sample adolescents with ADHD were younger at the first trial of the substances and the average number of comorbid disorders was higher in this group than those without ADHD [12]. Although, previous studies suggested that pharmacological treatment of children with ADHD actually decreased the risk of later SUD [16–19], 5% to 50% of adolescents and adults with SUD are estimated to have ADHD [20,21].

1.3. Relationship between attention deficit hyperactivity disorder and psychological symptoms

ADHD often co-occurs with other mental disorders [20], such as depression and anxiety disorder [8,22,23]. Yuce et al. [24] reported that 96.3% of the Turkish adolescents with ADHD were found to have at least one psychiatric comorbid diagnosis. Among these diagnoses, depression and anxiety disorders were more common in girls. Research found that over one third of adolescents with ADHD have comorbid anxiety disorders [25,26]. Also a previous study suggested that a significant association exists between ADHS and the severity of anxiety symptoms in Taiwanese adolescents [8]. A recent study showed that anxiety and depression was related with a diagnosis of ADHD and ADHS [27]. Furthermore, symptoms of depression are also commonly related to the severity of ADHS [28] and may be another important mediating factor in the association of ADHD and SUD. Consistent with this, findings of the previous study suggest that compared to non-depressed adolescents with ADHD and SUD, those with co-occurring depression have more severe substance use at baseline and throughout the treatment [29].

Previous studies also showed that ADHS is associated with some psychological symptoms such as sensation seeking, anger, self-harm and risk of suicidality among adolescents [30–32]. Adult patients with ADHD showed a marked increase in depression symptoms, anger, suicidal ideation and suicidal attempts in outpatient drug centers in Hungary [32]. Similarly ADHS was associated with suicide attempts among adolescents [33]. Manor et al. (2010) [34] found that 65% of the adolescents who had attempted suicide

met the criteria of ADHD, but only 22% of them had been diagnosed with ADHD prior to suicide attempt. The results on the possible relationship between ADHS and suicidality are debatable: the main question is whether there is a direct association between ADHS and suicidality or ADHS increases the risk of suicide by increasing the prevalence of comorbid conditions such as depression, anxiety and impulsivity [35].

Among adolescents presenting to substance abuse treatment, both externalizing (e.g., ADHD, conduct disorder) and internalizing disorders (e.g., major depressive disorder, anxiety) commonly co-exist [36,37]. In pooled data from 4930 adolescents in multisite studies of SUD, 72–74% had conduct disorders, 61–64% had ADHD, 53% had depression, and 61% had both internalizing and externalizing disorders [38].

Although up to date a number of studies have examined the association between ADHD and SUD or psychiatric symptoms, little research has been done to examine the relationship between ADHS and lifetime substance use or severity of psychiatric symptoms such as anxiety, depression, anger, sensation seeking, self-harming and suicidal behavior among adolescents. This is the first study considering the severity of ADHS and these variables among 10th grade students that represent Istanbul. Adolescents with the ADHS and comorbid depression, anxiety symptoms and lifetime substance use need to get special focus [33]. Located between Europe and Asia with a population of 15 million, Istanbul is the biggest city of Turkey, which is a developing country with majority being Muslim. The aim of this study was to determine the severity of ADHS and association with lifetime substance use and psychiatric variables among 10th grade students in Istanbul/Turkey.

2. Methods

2.1. Settings and sample

Multi-stage sampling was performed to select subjects. Multi-stage sample was initially stratified according to the 15 districts of Istanbul. Tenth-grade students in different geographical areas and different schools were enrolled into the study. The primary sampling units were schools, selected with a probability proportional to student enrolment numbers (45 schools from the 15 districts). Next, 1 or 2 classes within each participating school were selected systematically with equal probability sampling. All students in selected classes were included into the study sample.

Five thousand three hundred eighty three students participated in the study and entered the system from the Internet and filled the questionnaire. Although none of the patients refused to participate in the study, 410 students were excluded because they left some parts of the scales unfilled, 35 students were excluded because of the trap question. Thus, a representative sample of 4938 students participated in the study. When we compared the students excluded from the study and included in the study, mean age (16.69 ± 6.44 ,

15.58 ± 2.85 respectively, $t = 3.57$, $p < 0.001$) and male ratio (62.8% and 52.7% respectively, $\chi^2 = 16.11$, d.f. = 1, $p < 0.001$) were higher in the excluded group.

2.2. Measures

The questionnaire administered online in the study was similar with the questionnaire used formerly in Turkey [39–41]. This questionnaire was adapted and developed from a large international scale used in European school survey known as the European School Survey Project on Alcohol and Other Drugs (ESPAD) [42] and previously used in published studies [43,44]. The questionnaire included sections about demographic data, school life and performance, psychological and behavioral problems, and the use of substances including tobacco, alcohol and drugs. Also the questionnaire included the Psychological Screening Test for Adolescents [45].

2.3. The Psychological Screening Test for Adolescents

The Psychological Screening Test for Adolescents (PSTA) [45] was developed by adaptation of the Examination and Assessment Form for Juvenile Offenders (ARDEF) [46], which was developed with the purpose of investigating risk of recidivism and needs of children and adolescents who are in conflict with the law. By shortening the number of ARDEF items PSTA questions were formed for screening purposes. The scale has 5 subscales; depression, anxiety, ADHS, anger and sensation seeking. The scale has 27 questions with answers “yes” or “no”, whereas ADHS subscale with 5 questions has 3 answers “yes”, “partially” and “no”. The statistical investigations have shown that PSTA has an interrater reliability of $r = 0.89$ and a high internal reliability ($\alpha = 0.79$). There is a high level of positive correlation between Youth Self Report which is widely used among 6 to 18 years old adolescents for psychological problems, and PSTA total score ($r = 0.60$) [47]. Cronbach’s α for depression (0.72), anxiety (0.60), impulsiveness (0.77), anger (0.75), lack of assertiveness (0.67) and sensation seeking (0.70) were moderate, whereas for PSTA it was high as 0.80 in the present study.

2.4. Procedure

The study was carried out between October 2012 and December 2012. The study was made online. A web site has been prepared for this purpose. The Ethical Committee of the Acibadem University approved the study. A research assistant has been assigned for each school included in the study. Research assistants of 45 schools were given an education for how to participate in the study. The study protocol was thoroughly explained to students by these research assistants. The students were asked to fill out the form on the web site. Questionnaires in the system were filled in anonymously. Informed consent was approved by students by clicking the link on the web site. In the online system it is not allowed to leave the questions blank however

the student who wishes not to answer the questions was allowed not to answer and leave the program without filling the questionnaire.

2.5. Statistical methods

The statistical package SPSS 17.0 for Windows (SPSS 278 Chicago, IL) was used for all the analyses. Mean scores of ADHS according to the categorical variables were compared by means of the Student t test. Pearson correlational analyses were used to determine the relationships between ADHS and other subscales. In univariate covariance analysis (ANCOVA), severity of ADHS was a dependent variable and depression, anxiety, anger, sensation seeking, lifetime tobacco, alcohol and substance use, self-harming behavior and suicidal thoughts were independent variables. For all statistical analysis, p values were 2 tailed, and differences were considered significant at <0.05 .

3. Results

The present study revealed that the mean score of ADHS was higher in females than males. Also those with a lifetime tobacco, alcohol and drug use, self-harming behavior and suicidal thoughts had a higher mean ADHS score than those without (Table 1). The severity of ADHS score was correlated with depression, anxiety, anger and sensation seeking scores (Table 2). According to univariate covariance analysis (ANCOVA), depression, anxiety, anger, sensation seeking, lifetime alcohol use and suicidal thoughts predicted the ADHS score (Table 3).

4. Discussion

One of the main findings of the present study was that ADHS scores were higher among students with a lifetime

Table 1
Mean scores of attention deficit hyperactivity symptoms (ADHS) according to gender, presence of self-harming behavior, suicidal thoughts, lifetime tobacco, alcohol and drug use.

		ADHS n = 4938			
		Mean	SD	t	p
Gender	Female (n = 2337)	3.62	2.09	2.57	0.010
	Male (n = 2601)	3.47	2.04		
Tobacco	Absent (n = 2429)	3.16	2.03	-12.77	<0.001
	Present (n = 2509)	3.90	2.04		
Alcohol	Absent (n = 3204)	3.29	2.03	-11.45	<0.001
	Present (n = 1734)	3.99	2.07		
Any drug ^a	Absent (n = 4371)	3.42	2.04	-11.03	<0.001
	Present (n = 567)	4.43	2.11		
Self-harming	Absent (n = 4232)	3.36	2.02	-15.38	<0.001
	Present (n = 706)	4.62	2.04		
Suicidal thoughts	Absent (n = 4289)	3.35	2.02	-16.81	<0.001
	Present (n = 649)	4.77	1.98		

^a Other than alcohol and tobacco.

Table 2
Correlations between the scales.

	ADHS	Depression	Anxiety	Anger
Depression	0.33*			
Anxiety	0.34*	0.55*		
Anger	0.39*	0.42*	0.45*	
Sensation seeking	0.33*	0.28*	0.27*	0.40*

ADHS: attention deficit hyperactivity symptoms.

tobacco, alcohol and drug use. This may suggest that ADHS is at least related with first and early trial of alcohol, drug and tobacco. Consistent with this, studies showed that childhood ADHD may be a risk factor for SUDs and nicotine dependence in adolescence [13,48,49]. However, among substance clusters (alcohol, any drug and tobacco) investigated in the present study, only lifetime use of alcohol predicted the severity of ADHS in Turkish adolescents. The presence of ADHS may affect the course of adolescent substance abuse in several ways including an earlier age of onset [50], longer duration of substance use, and progression from alcohol abuse to another SUD [12]. A meta-analysis based on 13 studies concluded that childhood ADHD was associated with alcohol use disorder in young adulthood and with nicotine use in middle adolescence [11]. Adolescents who have comorbid ADHD and SUD are at greater risk for negative outcomes [51] and may be more difficult to treat than adolescents with only one of the diagnoses. Nevertheless, it is suggested that not only ADHD and SUD diagnoses but also the greater severity of both substance use and ADHS are associated with poorer treatment outcomes [52]. Thus, clinicians should take into consideration lifetime tobacco and alcohol/substance use for adolescents with ADHS [12]. Nevertheless, it is difficult to say anything about the causal relationship, because the present study was a cross-sectional one.

Table 3
Univariate covariance analysis (ANCOVA) with attention deficit hyperactivity symptoms score as dependent variable.

	Type III sum of squares	df	Mean square	F	p
Male gender	1.500	1	1.500	0.453	0.501
Depression	166.115	1	166.115	50.222	<0.001 ^a
Anxiety	198.850	1	198.850	60.119	<0.001 ^a
Anger	456.273	1	456.273	137.947	<0.001 ^a
Sensation seeking	408.807	1	408.807	123.596	<0.001 ^a
Tobacco	4.016	1	4.016	1.214	0.271
Alcohol	13.853	1	13.853	4.188	0.041 ^a
Any substance ^b	0.176	1	0.176	0.053	0.817
Self-harming behavior	2.591	1	2.591	0.783	0.376
Suicidal thoughts	78.229	1	78.229	23.651	<0.001 ^a

$R^2 = 0.229$ (adjusted $R^2 = 0.228$).

Covariants were scores of depression, anxiety, anger, sensation seeking, lifetime tobacco, alcohol and substance use, self-harming behavior and suicidal thoughts.

^a Statistically significant.

^b Other than alcohol and tobacco.

Most of the studies in the literature found the rate of ADHD higher among males than females. Although results of the present study may seem incompatible with these studies, actually we evaluated ADHS rather than diagnosis of ADHD. Consistent with this, Monuteaux et al. [53] also found a significantly higher level of ADHS in females compared to males. Moreover, it is suggested that the severity of ADHS may change according to the sample, the scale that is used to measure ADHS and design of the study [54]. The present study was an online survey. Since leaving some parts of the scales unfilled was the main reason of exclusion, which may be considered as a symptom of ADHD, we may suggest that ADHS might be higher in this male dominant excluded group. Nevertheless, female gender was no longer associated with ADHS in ANCOVA. Thus, this finding should be interpreted cautiously until confirmed by future studies comparing males versus females with ADHD.

Another important finding of the present study, consistent with the previous studies [8,23,24,27,31,32] was that the severity of ADHS was correlated with the severity of depression, anxiety, anger and sensation seeking. These symptoms and suicidal thoughts also predicted the severity of ADHS in the present study. Sensation seeking has been correlated with drug use and other high-risk behaviors in adolescents [55,56]. Results of the previous study indicated that sensation seeking moderated the association between ADHS and over-the-counter stimulants [57]. It was suggested that understanding sensation seeking in ADHD adolescents as they move through puberty will aid clinicians in monitoring ADHD adolescents and their trajectory into high-risk behaviors [31]. In previous studies ADHS was associated with raised risk of major depressive disorder [23], severity of anxiety symptoms [8] and risk of suicidality [33] in adolescence. Balazs et al. [33] suggested that the mechanisms of the relationship between risk of suicidality and ADHD can be understood only when developmental factors are considered. According to the results of the present study, we may speculate that the severity of psychiatric symptoms may mediate the relationship between ADHS and suicidal thoughts and attempts among Turkish adolescents. Consistent with this, in a previous study it was found that while the ADHD was not a strong predictor of suicide attempts, having one or more comorbid disorders was associated with fourfold to twelvefold elevated risk, which suggested that early treatment of ADHD and comorbidity may reduce the risk of suicide attempts and improve its prognosis [58]. According to a recent review, many ADHD patients remain untreated because of the frequent presence of psychiatric comorbidities [1]. Nevertheless, considering the substantial costs of self-harming behavior and suicide attempts from a societal perspective and from the point of view of the individual sufferer, our results highlight the importance of the diagnostic investigation of substance use, risk of suicidality and comorbid psychiatric symptoms routinely in the protection of Turkish adolescents with ADHS in Istanbul.

Although previous studies showed that ADHD is associated with substance use, risk of suicidality and comorbid psychiatric symptoms among adolescents [7,8,11–13,24,58], as far as we know, there are no large studies conducted among Turkish adolescents. Methodology is the strongest point of the present study, as it employs adequate sample size and proper sampling method, whereas the main limitation was the cross-sectional nature of the study; hence, we were only able to report associations rather than definitive temporal or causal relationships. Another important limitation is that the analyses were based on self-reported data. Finally, our sample was only representative for high schools in Istanbul, which limits the generalizability of our results to Turkey in general.

As a result, notwithstanding these limitations, at the minimum, the present study's findings suggest that, since ADHS is associated with depression, anxiety, anger, sensation seeking, lifetime alcohol use and suicidal thoughts among 10th grade students, clinicians should screen these variables routinely in adolescents with ADHS.

Conflict of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Acknowledgment

This study was part of a project called as Youth Observation Study (GENCIZ) in Turkey, which through its web site allows surveys for high school and university students from different cities.

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