



Relationship of Probable Attention Deficit Hyperactivity Disorder with Severity of Psychopathology and Impulsivity in a Sample of Male Patients with Opioid Use Disorder

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Objective The aim of the present study was to evaluate relationship of probable attention deficit hyperactivity disorder (ADHD) with severity of psychopathology and the effect of impulsivity on this relationship in a sample of male patients with opioid use disorder (OUD).

Methods Participants included 234 patients (115 inpatients and 119 outpatients) with OUD. Participants were evaluated with the Adult ADHD Self-Report Scale (ASRS-v1.1), the Symptom Checklist-90-R (SCL-90-R) and the Short Form of Barratt Impulsiveness Scale (BIS-11-SF).

Results Psychopathology and impulsivity scores were higher among those with the probable ADHD. ADHD scores were mildly to moderately correlated with impulsivity and psychopathology scores. In logistic regression analyses, while severity of general psychopathology and impulsivity predicted probable ADHD in the first Model, in the second Model, among dimensions of psychopathology obsessive compulsive (OC) dimension, whereas among dimensions of impulsivity non-planning and motor impulsivity predicted probable ADHD.

Conclusion These findings suggest that probable ADHD is related with the severity of psychopathology, particularly OC dimension, while the severity of impulsivity may have an partial mediator (particularly non-planning and motor impulsivity) effect on this relationship among patients with OUD.

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Key Words ADHD, Impulsivity, Obsessive compulsive, Opioid use disorder, Psychopathology.

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a childhood-onset disorder characterized by hyperactivity/impulsivity (HI) and inattention (IN) that negatively impacts one's ability to function and fulfill social and personal obligations.¹ ADHD persists into adolescence and adulthood in more than half of the cases² and due to their symptoms individuals with

ADHD experience more difficulties while coping with problems through their life and they become more vulnerable to use substance, thus may develop substance use disorder (SUD).^{3,4} Thus, ADHD is often diagnosed in SUD patients. In a large cross-sectional international study, the prevalence of adult ADHD was 13.9% in treatment seeking SUD population,⁵ whereas according to a meta-analysis the prevalence for possible ADHD was 23.1% among individuals with SUD.⁶ Individuals with ADHD and SUD comorbidity are at greater risk for more negative outcomes⁷ and poor treatment outcomes for both SUD and ADHD.⁸

If we specifically focus on opioid use disorder (OUD), few studies reported the effect of ADHD on patients receiving methadone maintenance treatment (MMT) in western countries,⁹⁻¹¹ in Israel¹² and in Taiwan.¹³ King et al.⁹ found a 16.7% prevalence of adult ADHD in a group of 125 patients entering MMT. The ADHD patients were characterised by greater psychiatric comorbidity and a greater number of personality disorders, es-

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pecially antisocial personality disorders. In the second study, among admissions to a Midwestern MMT program 396 (58%) patients self-reported experiencing one or more ADHD symptoms during the two weeks prior to admission, and 131 (19%) patients reported ADHD symptoms that significantly interfered with functioning in daily activities.¹⁰ At nine months post-admission, the patients who reported significant symptoms of ADHD were less likely to have achieved abstinence than those who did not report significant symptoms. In the third study conducted among 193 patients in long-term MMT, Carpenter et al.¹¹ found that 48 (24.9%) had persisting ADHD in adulthood, and these patients had significantly higher problem severity scores, lower quality of life scores, more comorbid SUD and more psychiatric comorbidity (independent of conduct disorder). Study conducted in Israel found that 51 patients (33.1%) had childhood ADHD [33 of whom (62.7%) were also found to have adult ADHD (15 possible and 17 definite)], and more of this group currently had clinical obsessive compulsive disorder (OCD) compared to patients who did not have childhood ADHD (55.3% vs. 30.1%), and both conditions were highly prevalent among MMT patients.¹² According to a recent study conducted in Taiwan, among patients with OUD in MMT 7.8% (n=35) scored 24 (which is a high cut-off score) or higher of ASRS indicating highly likely adult ADHD.¹³ They were comorbid with regard to depression, greater SUD severity, and poorer quality of life.¹³ As far as we know there is no study regarding prevalence of probable ADHD in patients with OUD in Turkey. Also only approved opioid maintenance treatment in Turkey is buprenorphine/naloxone combination, and our clinic do follow most of the patients who receive this treatment in Istanbul.

Treatment-seeking SUD patients with ADHD are at a very high risk for additional psychiatric disorders; 75% of ADHD patients had at least one additional comorbid disorder compared with 37% of SUD patients without ADHD.⁵ Previous studies conducted among patients receiving MMT showed that the risk of psychiatric comorbidity and the severity of psychopathology are increased among those with ADHD.^{9-11,13}

Previous studies have shown that patients with current OUD have higher levels of impulsivity than non-SUDs do on measures of impulsivity,^{14,15} while impulsivity measured with the Barratt Impulsiveness Scale (BIS-11) distinguishes OUDs from non-SUDs.¹⁶ Even the patients receiving MMT¹⁷ and buprenorphine maintenance treatment (BMT)¹⁵ scored higher on the BIS-11 subscales than did normal volunteers with no history of SUD. In our previous 12-month follow-up study conducted among patients receiving BMT, impulsivity, particularly motor impulsiveness, discriminated the relapsed group from the maintenance group.¹⁸ The continuous intake of opioid increases levels of impulsivity that return to baseline (preopioid) lev-

els throughout abstinence; in subjects with OUD, impulsivity therefore becomes more intense as a result of chronic opioid exposure, rather than being a vulnerability trait.¹⁹ Subjects with OUD may prefer this substance because of the self-medication dynamics, which have positive effects in managing the preexisting aggressiveness²⁰ that is usually supported by impulsiveness.²¹ It may therefore be true that individuals who become opioid users are more likely to show impulsiveness, not because of the drug itself, but because of a preexisting pre-morbid impulsive disposition that leads them to form ties selectively with opioid.²² Consistent with this, study conducted among patients in MMT suggested that ADHD during childhood (one third of the sample) may have led them to self-medicate with opioid and thus to OUD.¹²

The present study hypothesizes that there is a relationship between probable ADHD and certain psychopathology among male inpatients with OUD, and the severity of impulsivity may have effect on this relationship. To our knowledge, this is the first study to evaluate the relationship between psychopathology and probable ADHD among male subjects with OUD, which is an important phenomenon in clinical settings.

METHODS

Subjects

The study was conducted in Bakirkoy Training and Research Hospital for Psychiatry, Neurology and Neurosurgery, Alcohol and Drug Research, Treatment and Training Center in Istanbul between September 2014 and April 2015. It is a specialized center for substance use disorders with 84 inpatient beds (48 beds for SUD other than alcohol) and accepts patients from all over Turkey. The study was approved by the Ethical Committee of the institution and was in accordance with the Helsinki Declaration (1975, revised 1983). Patients' written informed consent was obtained after the study protocol was thoroughly explained.

Consecutively admitted 234 male patients (115 inpatients and 119 outpatients) with OUD were considered for participation in the study. All participants meet the DSM-5²³ diagnostic criteria for OUD. Interviews with the study group were conducted after a stabilization period, that is, 1 to 2 weeks after the last day of heroin use.

Measures

Adult ADHD Self-Report Scale

In conjunction with the World Health Organization (WHO)²⁴ developed a self-report scale for the screening of ADHD in adults (ASRS-v1.1; 10). The scale they propose is a short, 18-item scale (9 item for IN and 9 items for HI) which relates di-

rectly to the DSM IV TR diagnostic criteria. This 18 statements describing aspects of ADHD that are rated on a 5-point Likert scale from “0-never” to “4-very often.”

ASRS is also a short 6-item screening instrument, the questions in which were extracted, using stepwise logistic regression, from a larger survey of 18 questions comprising the Adult Self-Report Survey that taps the 18 specific “Criterion A” symptoms defining the disorder in DSM-IV. The ASRS 6-item screen was developed for community based studies and exhibits strong concordance with clinician diagnoses as well as sound psychometric properties.²⁵

The 5-point Likert-type scale ranges from “0” (never) to “4” (very often). Thus, the possible range of scores on the ASRS screening version is 0 to 24, with higher scores indicating more ADHD symptomology. Each response of sometimes or greater (2 or more) on screening items 1–3 equated to 1 point; each response of ten or greater (3 or more) on screening items 4–6 resulted in a point. A total score of 4 or more indicated probable ADHD. We therefore used this recommended definition to identify highly likely ADHD cases in our sample and named as “probable ADHD.” Previous data suggest that this approach is widely used and the 6-item screening version has been shown to outperform the full 18-item version in sensitivity (68.7% vs. 56.3%) and specificity (99.5% vs. 98.3%) in American general population.^{26,27}

The scale was validated in Turkish in a sample of university students previously.²⁸ Specifically, in a sample of patients with AUD, psychometric characteristics of Turkish version have been analyzed,²⁹ in which satisfactory properties have been found. In the present study, other than 6-item version, 18-item version was also used in order to evaluate the severity of IN and HI symptoms. The severity of these dimensions was measured by summing the scores of each 9 items per subscale. ASRS-18 evaluates the symptoms of ADHD for over the past 6 months. Nevertheless the result of the test does not replace clinical diagnosis and the clinician must take false positives into consideration by evaluating ASRS positives with gold standart scales.

Adults who have ADHD need not have been formally diagnosed in childhood. Evidence of early-appearing and long-standing problems with attention or self-control in patient’s history should be evaluated. Some significant symptoms should have been present in childhood, but full symptomology is not necessary.³⁰

Short Form Barratt Impulsiveness Scale

The latest form of BIS-11 was developed in 1995, which was a 30 item scale.³¹ Reliability and validity study for Turkish version of this scale was conducted by Gulec et al.³² A 15-item short form of the BIS (BIS-11-SF) that retains the 3-factor struc-

ture (nonplanning impulsivity, motor impulsivity, and attention impulsivity), and maintained good reliability and validity was presented by Spinella,³³ whereas adaptation of Turkish version of this scale was conducted by Tamam et al.³⁴

90-Item Symptom Checklist-Revised

SCL-90-R is a self-report measure³⁵ used to assess psychopathologic symptoms. It has 90 items rated with a 5-point Likert scale (1, no problem to 5, very serious) to assess the extent to which individuals have experienced the listed symptoms in the last 7 days. These 90 items were grouped into nine subscales, namely, somatization, obsessive compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism. It was suggested that the higher the scores on SCL-90-R is, the higher the psychological distress that the individual has experienced. In the present study, the Turkish version of SCL-90-R was used.³⁶

Data analysis

The statistical package SPSS 17.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for all the analyses. Student t test was used to compare groups according to current age, duration of education and scale scores. Categorical sociodemographic variables were compared by means of the χ^2 statistics. Taken the presence of probable ADHD as a dependent variable, hierarchical (dimensions of psychopathology and dimensions of impulsivity) logistic regression models were performed. For all statistical analysis, p values were 2 tailed, and differences were considered significant at $p < 0.05$.

RESULTS

Age, age at first heroin use, duration of heroin use, marital, educational, employment status and type of the treatment (inpatient/outpatient) did not differed between those with the probable ADHD (n=54, 23.1%) and those without (n=180, 76.9%). While the severity of withdrawal symptoms did not differed between the groups, severity of craving was higher among those with the probable ADHD. Psychopathology and impulsivity scores were higher among those with the probable ADHD (Table 1).

ADHD scores were midly to moderately correlated with impulsivity and psychopathology scores (Table 2).

In the first logistic regression analysis, severity of general psychopathology was related with the probable ADHD in the first step, whereas when severity of impulsivity was entered in the analysis as a independent variable in the second step severity of both general psychopathology and impulsivity were related with probable ADHD (Table 3). In the second Model when subdimensions of SCL-90-R were entered in the

analysis as independent variables instead of general psychopathology, obsessive compulsive (OC) dimension was solely related with probable ADHD (Table 3). In the second step of this Model, subdimensions of BIS-11-SF were entered in the analysis as independent variables instead of severity of impulsivity (measured with BIS-11-SF), which showed that among dimensions of impulsivity non-planning and motor impulsivity were related with probable ADHD, together with OC dimension of SCL-90-R (Table 3).

OC was mildly correlated with non-planning ($r=0.33$, $p<0.001$), motor ($r=0.34$, $p<0.001$), attentional ($r=0.38$, $p<0.001$) and total score of BIS-11-SF ($r=0.45$, $p<0.001$) (not shown). In linear regression analysis all the impulsivity subscales (non-planning, motor and attentional) predicted OC ($B=0.049$, 0.053 , and 0.065 respectively, $S.E.=0.017$, 0.021 , and 0.022 respectively, $Beta=0.186$, 0.170 , and 0.213 respectively, $t=2.844$, 2.464 , and 2.926 respectively, $p=0.005$, 0.014 , and 0.004 respectively, $F=19.369$, $df=3$, 232 , $p<0.001$, Adjusted $R^2=0.19$)

Table 1. Sociodemographic and scale scores according to the presence of probable ADHD

	No ADHD		Probable ADHD		t	p
	N=180, 76.9%		N=54, 23.1%			
	Mean	SD	Mean	SD		
Age	27.07	7.39	27.83	8.53	-0.640	0.523
Duration of education	9.03	2.77	9.80	2.60	0.656	0.513
First age of opioid use	20.26	5.16	19.19	5.76	1.302	0.194
Duration of opioid use	6.82	5.96	8.65	7.10	-1.892	0.060
Severity of withdrawal	13.28	7.88	13.02	7.70	0.218	0.828
Severity of craving	13.82	7.76	17.43	7.32	-3.032	0.003
SCL-90						
Somatic complaints	1.34	0.72	1.84	0.77	-4.363	<0.001
Obsessive compulsive	1.43	0.82	2.18	0.84	-5.889	<0.001
Interpersonal sensitivity	1.43	0.92	2.01	0.83	-4.167	<0.001
Depression	1.56	0.89	2.31	0.94	-5.428	<0.001
Anxiety	1.23	0.84	1.87	0.93	-4.755	<0.001
Hostility	1.27	0.97	2.02	1.03	-4.945	<0.001
Phobias	0.63	0.67	1.15	0.70	-4.914	<0.001
Paranoid ideation	1.23	0.86	1.77	0.84	-4.103	<0.001
Psychotic	0.89	0.75	1.41	0.73	-4.521	<0.001
SCL-90 total score	12.71	7.16	18.95	7.34	-5.580	<0.001
BIS-11-SF						
Non-planning	11.61	3.26	14.39	2.84	-5.661	<0.001
Motor	9.68	2.63	12.00	2.66	-5.679	<0.001
Attentional	9.27	2.73	11.85	2.51	-6.192	<0.001
	N	%	N	%	χ^2	p
Marital status						
Single	140	77.8	45	83.3	0.807	0.668
Married	28	15.6	6	11.1		
Divorced	12	6.7	3	5.6		
Employment status						
Not working	117	65.0	40	74.1	2.079	0.354
Employed	43	23.9	8	14.8		
Type of the treatment						
Inpatient	86	47.8	29	53.7	0.584	0.445
Outpatient	94	52.2	25	46.3		

Independent Samples t-test, chi-Square test, significance at $p<0.05$. SD: standard deviation, ADHD: attention-deficit/hyperactivity disorder, SCL-90: 90-Item Symptom Checklist-Revised, BIS-11-SF: Short Form Barratt Impulsiveness Scale

(not shown).

DISCUSSION

The rate of probable ADHD found among patients with OUD in this study (23.1%) was consistent with the previous

Table 2. Correlations between the scale scores

	IN	HI	ASRS
Somatic complaints	0.474	0.340	0.451
Obsessive compulsive	0.488	0.395	0.487
Interpersonal sensitivity	0.379	0.328	0.389
Depression	0.437	0.346	0.433
Anxiety	0.490	0.347	0.464
Hostility	0.431	0.401	0.457
Phobias	0.433	0.265	0.389
Paranoid ideation	0.403	0.323	0.401
Psychotic	0.406	0.327	0.405
SCL-90	0.501	0.392	0.494
Non-planning	0.383	0.319	0.387
Motor	0.391	0.417	0.442
Attentional	0.384	0.468	0.463
BIS-11-SF	0.494	0.508	0.549

Pearson correlation test, all correlations were significant at $p < 0.001$. ADHD: attention-deficit/hyperactivity disorder, HI: hyperactivity/impulsivity, IN: inattention, ASRS: Adult ADHD Self-Report Scale, SCL-90: 90-Item Symptom Checklist-Revised, BIS-11-SF: Short Form Barratt Impulsiveness Scale

study conducted among patients receiving MMT (24.9%)¹¹ and was same as with the rate reported in meta-analysis for patients with SUD.⁶ One of the main findings of the present study is that the probable ADHD is related with the severity of psychopathology, particularly OC dimension, while the severity of impulsivity may have a partial mediator (particularly non-planning and motor impulsivity) effect on this relationship among patients with OUD.

While “impulsivity” may be defined as a part of the ADHD construct, the term may also be applied to characteristics that are conceptually and psychometrically distinct. The BIS-11-SF measures three subtypes of impulsiveness: cognitive (attentional) impulsiveness (IN and cognitive instability), motor impulsiveness (motor disinhibition), and non-planning impulsiveness (lack of self-control and intolerance of cognitive complexity).³¹ Thus, although impulsivity sub-dimensions measured with BIS-11-SF may overlap with ADHD symptoms,³⁷ they are different constructs. Impulsivity and consequent risk-taking are associated with both ADHD and SUD. Impulsivity is a core diagnostic feature of HI and combined presentations of ADHD, and may be a determining factor in the initiation and maintenance of substance use^{38,39} with increased levels of impulsivity consistently found among those with SUD.^{38,40} Additionally, SUD may facilitate impulsive acts by interfering with normal inhibitory controls.³⁸

The concept of comorbidity between ADHD and OCD has been discussed for two decades.⁴¹ Both disorders seem to lie on opposite ends of a clinical impulsive-compulsive continu-

Table 3. Predictors of probable ADHD in a logistic regression

	B	SE	Wald	df	p	Exp (B)	95% CI for EXP (B)	
							Lower	Upper
Model 1 ^a								
SCL-90 total score	0.113	0.023	24.097	1	<0.001	1.120	1.070	1.172
Model 1 ^b								
SCL-90 total score	0.067	0.026	7.001	1	0.008	1.070	1.018	1.125
BIS-11-SF total score	0.167	0.033	25.980	1	<0.001	1.181	1.108	1.260
Model 2 ^a								
Obsessive compulsive	1.051	0.205	26.386	1	<0.001	2.861	1.916	4.273
Model 2 ^b								
Obsessive compulsive	0.638	0.226	7.942	1	0.005	1.893	1.215	2.951
BIS-11-SF total score	0.163	0.033	24.831	1	<0.001	1.177	1.104	1.255
Model 2 ^c								
Obsessive compulsive	0.643	0.227	8.056	1	0.005	1.902	1.220	2.965
Non-planning	0.180	0.063	8.145	1	0.004	1.198	1.058	1.355
Motor	0.172	0.075	5.305	1	0.021	1.188	1.026	1.375
Attentional	0.138	0.076	3.309	1	0.069	1.148	0.989	1.332

Nagelkerke R^2 : 1^a=0.171, 1^b=0.348, 2^a=0.189, 2^b=0.353, 2^c=0.354, significance at $p < 0.05$. CI: confidence Interval, SCL-90: 90-Item Symptom Checklist-Revised, BIS-11-SF: Short Form Barratt Impulsiveness Scale

um.⁴² Reported co-occurrence rates are highly inconsistent in the literature;⁴¹ comorbidity rate of ADHD among adults with OCD ranged between 2.0% to 22.9%,^{43,44} whereas the prevalence of OCD among adult patients with ADHD was reported to be between 1% to 13%.^{44,45} The findings of the previous studies suggest that a subset of patients with childhood ADHD may be at elevated risk of developing OCD,⁴⁴⁻⁴⁶ including patients in MMT [odds ratio (OR) 3.8, 95% confidence interval (CI) 1.6–8.8].¹² Nevertheless, a recent review suggested that clinicians are encouraged to consider the possibility that ADHD-like symptoms resulting from OCD-specific symptomatology may be misdiagnosed as ADHD particularly in adults.⁴¹

In addition to the high co-occurrence of OCD and ADHD, several studies have shown elevated levels of subclinical OC symptoms (SOCS) among those with ADHD.⁴⁷⁻⁵⁰ SOCS refers to OC symptoms that are not severe or frequent enough to warrant a diagnosis of OCD. Among adults with ADHD, the highest elevation on the SCL-90-R has been found on the OC subscale³⁵ regardless of whether they exhibited the inattentive or combined type of ADHD.⁴⁹ A study conducted among 1015 undergraduate students found that SOCS, especially checking and detailed oriented characteristics, were significantly correlated with self-reported ADHD symptoms.⁴⁸ Another study found that young adults with ADHD and no prior diagnosis of OCD had significantly more intrusive and worrisome thoughts than healthy controls.⁴⁷ The authors of this last study suggested that difficulties inhibiting and pushing away unwanted thoughts may be a manifestation of problems with response inhibition. Finally, a more recent study suggested that SOCS were the most commonly reported psychological symptom on the SCL-90-R in adults with ADHD, and only the OC subscale had a mean score approaching the clinically relevant range even though those with OCD were excluded.⁵⁰ Being consistent with results of the present study, these findings supported the hypothesis that individuals with ADHD with response inhibition difficulties tend to report more SOCS.

Impulsivity, particularly non-planning and motor impulsivity, had a partial mediator effect on the relationship between OC and probable ADHD in the present study among patients with OUD. A recent study conducted among Turkish patients with OCD suggested that total, attentional, and motor subscale mean scores of BIS-11 were higher among the patients with ADHD comorbidity, and BIS-11 score predicted the presence of ADHD among OCD patients.⁴³ They have found that mean number of obsession and compulsions were more frequent in the ADHD-OCD group compared with the OCD group. This finding might indicate that the presence of ADHD could lead to a reduced resistance against obsessions and compulsions, as Walitza et al.⁵¹ suggested. Another recent study conducted among Turkish patients with OCD suggested that

childhood ADHD symptoms are associated with an earlier age of OCD, higher impulsivity, particularly motor impulsivity.⁴⁴ While some studies found significant correlations between the attentional subscores of BIS-11 and OCD symptoms (obsession and compulsion),⁵² there are also studies that found higher motor impulsiveness in OCD patients than in controls.⁵³ In the present study all the impulsivity subscales were mildly correlated with OC and they all predicted OC in a linear regression model.

The present study also has some limitations. First, because this study is cross-sectional, its findings cannot indicate the causal relationships among the primary constructs of interest. Second, female patients may have a different profile concerning ADHD, psychopathology and impulsivity. Third, actually we evaluated the probable ADHD rather than diagnosis of ADHD, and it is suggested that the severity of ADHD symptoms may change according to the sample, the scale that is used to measure ADHD symptoms, and design of the study.⁵⁴ Fourth, although all the scales used in the present study were validated in Turkish, since they are self-rating screening scales, they may only indicate the individuals with a high probability of ADHD or psychopathology, rather than the diagnosis. Finally, the generalizability of the findings of the present study to the wider, non-treatment-seeking, mixed-sex population with OUD requires further study.

These findings suggest the importance of screening for and management of ADHD symptoms in BMT programs and related constructs such as OC and impulsivity, may be helpful in improving outcome of these patients receiving BMT in Turkey.

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