Article

The Prevalence of ADHD and Comorbid Disorders in Iranian Adult Male Prison Inmates

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Mohammad Hamzeloo[1,2], Ali Mashhadi[1], and Javad Salehi Fadardi[1]

Abstract

Objective: The aim of the present study was to explore the prevalence of ADHD and comorbid disorders in a community sample of adult male prisoners in Iran. **Method:** Through stratified sampling method, 908 adult male prison inmates in Gorgan Prison were recruited on a voluntary basis. Diagnostic assessments were based on the Adult ADHD Self-Report Scale Screener and a clinical interview based on *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) criteria and psychiatric interview. Comorbid disorders were assessed with the Beck Anxiety Inventory, Beck Depression Inventory–Second Edition, and Millon Clinical Multiaxial Inventory–III. **Results:** ADHD was present in 147 participants (16.2%). Eighty-five percent of participants with ADHD reported lifetime substance abuse. They had higher rates of mood (40.8%) and anxiety (55.1%) disorders. Antisocial and borderline personality disorders were also more prevalent among offenders with ADHD. **Conclusion:** ADHD is prevalent in offenders and it is associated with comorbid disorders. The results emphasize the necessity of treatment programs for offenders with ADHD. *(J. of Att. Dis. 2016; 20(7) 590-598)*

Keywords

adult ADHD, prevalence, offenders, Iran

ADHD is one of the most commonly diagnosed neuropsychiatric disorders among children and adolescents. According to the American Psychiatric Association (APA, 2000), ADHD is estimated to affect about 3% to 7% of school-age children. ADHD is characterized with attention difficulties, motor hyperactivity, and impulsivity. Longitudinal studies of children with ADHD suggest that 10% to 70% of children with ADHD achieve full syndrome or partial remission of symptoms into adulthood (Adler, Barkley, & Newcorn, 2011; Barkley, Murphy, & Fischer, 2008; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993; Spencer, Biederman, Wilens, & Faraone, 2002; Weiss, Hechtman, Milroy, & Perlman, 1995; Wender, Wolf, & Wasserstein, 2001). The overall prevalence of adult ADHD in a cross-national study has been estimated 1.2% to 7.3% in different countries and averaged 3.4% (Fayyad et al., 2007). Follow-up studies have shown that the course and pattern of some symptoms change over time. Although motor hyperactivity seems to decline in adulthood, attention difficulties are more persistent and may even increase, and may actually become more impairing in adult life (Halmoy, 2011). For example, empirical studies indicate that ADHD drivers fail to stay attentive for a longer time and easily get distracted by irrelevant stimuli and, therefore, might have increased risk for driving mistakes and motor vehicle crashes (Barkley, 2004; Rosenbloom & Wultz, 2011). Additional psychopathological symptoms in adults include deficits in self-regulation, educational and occupational difficulties, psychological maladjustments, and other adaptive impairments (such as money management, unhealthy lifestyles, risky sexual activity, and impaired stress tolerance; Barkley et al., 2008). In comparison with individuals with similar intellectual abilities, adults with ADHD have poorer educational level and academic achievement (Rösler et al., 2004). In addition, adult ADHD displays a significantly elevated risk for marital problems, separation, and divorce (Barkley et al., 2008).

There is evidence to suggest that individuals with ADHD have increased risk for delinquency (Vermeiren, 2003). Studies suggest that ADHD is common among prison inmates (Edvinsson, Bingefors, Lindstrom, & Lewander, 2010; Einarsson, Sigurdsson, Gudjonsson, Newton, &

[1]Ferdowsi University of Mashhad, Iran
[2]Gorgan State Prison, Gorgan, Golestan, Iran

Corresponding Author:
Mohammad Hamzeloo, Ferdowsi University of Mashhad, Azadi Square, Mashhad, 9177948991, Iran.
Email: hamzelu_1979@yahoo.com

Bragason, 2009; Ginsberg, Hirvikoski, & Lindefors, 2010; Gudjonsson, Sigurddsson, Young, Newton, & Peersen, 2009; Rösler et al., 2004; Westmoreland et al., 2009; Young et al., 2009). The studies have used different methodologies in assessing childhood and adult ADHD symptoms. However, the overall results suggest that childhood ADHD among prison inmates ranges from 24% to 67% and adult ADHD ranges from 23% to 45%. The numbers clearly indicate that ADHD is more common among offenders than the general public (Ghanizadeh, Mohammadi, Akhondzadeh, & Sanaei-Zadeh, 2011).

Adults with clinical diagnosis of ADHD have higher rates of comorbid psychiatric disorders in life span (Sobanski, 2006). More than 80% of ADHD patients in clinical settings fulfill criteria for at least one, approximately 50% for at least two, and 32% for at least three other *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; APA, 1994) diagnoses (Barkley et al., 2008; Halmoy, 2011; Sobanski et al., 2007). Several studies have demonstrated a high prevalence of conduct disorder, antisocial personality disorder, borderline personality disorder, anxiety, and mood disorder among mainly male prison inmates (Einarsson et al., 2009; Ginsberg et al., 2010; Rösler et al., 2004; Westmoreland et al., 2009; Young et al., 2009). The studies show that more than 85% of offenders with ADHD suffer from drug-, alcohol-, or substance-related disorders (Rösler et al., 2004; Westmoreland et al., 2009).

Despite the high prevalence of ADHD among prison inmates, little attention has been paid to the prevalence of the disorder in Iranian prison inmates. Moreover, from etiological and preventive viewpoints, evidence suggests the importance of investigating the relationship between ADHD and various types of concomitant disorders and antisocial behaviors. Therefore, the aim of the present study was to investigate the prevalence of adult ADHD along with its comorbid psychopathologies and types of associated crimes among an Iranian prison population.

Method

Participants

The study population consisted of all male prison inmates in closed parts of Gorgan Prison that at the time of this study were in prison (1,864 individuals). In the prison, the *closed parts* are separated based on the prisoners' criminal titles. Among them, 932 patients (50%) were selected through stratified sampling method from closed parts. The participation in the study was voluntary, and participation in the study did not entitle them to any advantages or disadvantages in the prison. The objectives of the study were explained verbally and through the information sheet; the participants had every opportunity to ask questions at any step of the study, and they were told that they could withdraw from the study at any time without incurring any negative consequences. The ethics committee of Department of Psychology at Ferdowsi University of Mashhad had approved the study procedure and Gorgan Prison Research Committee monitored the quality of the research conduct through the study. Informed consents were gathered from the participant through their participation in the study. Of the sample, 29 participants did not fully complete the scales; hence, their data were omitted from the study. The final sample comprised 907 participants (mean age = 31.4, *SD* = 8.14; range = 18-70). It should be noted that due to the high risk of abusing off-ward psychedelic medications in the prisons, it was not possible to prescribe medications for those who were diagnosed with ADHD at the current study. The necessity of prescribing medications through a safe system for prisoners with ADHD needs to be reviewed by a specialized committee.

Instruments

Demographic information questionnaire. This questionnaire was used to obtain information about age, education, marital status, crime type, occupation, length of imprisonment term, length of actual time served on a sentence, and punitive history.

Adult ADHD Self-Report Scale (ASRS). The ASRS Symptoms Checklist and scoring system has been developed in conjunction with World Health Organization (WHO) and the work group on adult ADHD (Adler, Kessler, & Spencer, 2003). The ASRS evaluates the frequency of all 18 symptoms of ADHD defined by APA's (1994) *DSM-IV* criteria. Each question in the ASRS asks respondents to rate the frequency of a particular symptom of ADHD during the past 6 months on a 5-point response scale that consists of 0 = *never*, 1 = *rarely*, 2 = *sometimes*, 3 = *often*, and 4 = *very often*. The range of possible scores is between 0 and 36 for each of the two subscales (i.e., inattention and hyperactivity) and 0 to 72 for the total scale. The sum score for each scale 0 to 16 is considered as unlikely to have ADHD, 17 to 23 as likely to have ADHD, and 24 or higher as highly likely to have ADHD in related subtype. The total score 24 or higher in both subscales classified as combined subtype. The ASRS has demonstrated good reliability and validity in clinical and community samples (Adler et al., 2006; Kessler et al., 2007). We used a Persian version of the scale.

Clinical interview based on DSM-IV. Because self-report questionnaires, even when based on *DSM-IV* criteria, do not warrant a diagnosis of ADHD, in the present study, we also conducted a clinical interview based on *DSM-IV* to validate the results of the initial screening by the ASRS in regard with the participants' current and childhood symptoms and their functional impairment in different situations, including home, school, workplace, and social relationship. Next,

we obtained psychiatric history of individuals and explored for any physical causes of the symptoms (such as head trauma, cardiovascular disease, thyroid disease, and hypertension). Moreover, comorbid psychiatric disorders were assessed, including substance use disorders (SUD), personality disorders, mood disorders, and anxiety disorders. Finally, we took information about family psychiatric history, particularly learning disabilities, behavioral problems, attention deficit, and ADHD.

The Millon Clinical Multiaxial Inventory–III (MCMI-III). The MCMI-III (Millon, 1994) is a 175-item true–false inventory comprising a total of 3 modifier and 24 clinical scales derived from Millon's personality theory and paralleling *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed.; *DSM-III*; APA, 1980) and *DSM-IV* Axis I and II diagnostic categories. The modifier scales serve to identify the respondent's disclosure, desirability, and debasement. The clinical scales include 11 Moderate Personality Pathology scales, three Personality Pathology scales, representing greater levels of personality pathology, and 10 Severe Personality Pathology scales. The MCMI-III was chosen because it has a reliable and valid scale for measuring personality disorders. As recommended in the manual, a cutoff score of 85 or higher was used as diagnostic criterion. The Persian version of the MCMI-III has good psychometric (Sharifi, Molavi, & Namdari, 2007).

Beck Depression Inventory–Second Edition (BDI-II). The BDI-II (A. T. Beck, Steer, & Brown, 1996) is a 21-item self-report instrument that is developed to measure the existence and severity of symptoms of depression as listed in the *DSM-IV*. Each of the 21 items corresponding to a symptom of depression is summed up to give a single score for the BDI-II. There is a 4-point scale for each item ranging from 0 to 3. On two items (16 and 18), there are seven options to indicate either an increase or decrease of appetite and sleep. A total score between 0-13 is considered as minimal range, 14-19 as mild, 20-28 as moderate, and 29-63 as severe depression. BDI has been reported to be highly reliable regardless of the population. A Cronbach alpha of .91 has been calculated for the Persian version of the BDI-II across Iranian clinical samples (Dobson & Mohammad Khani, 2007).

Beck Anxiety Inventory (BAI). The BAI (A. T. Beck & Steer, 1990) is particularly developed to measure the severity of clinical symptom of anxiety. It has 21 items with 4-point scale that range from 0 to 3. Each item represents one symptom of anxiety that is usually experienced by individuals affected with anxiety disorders. The total score for all 21 symptoms can range between 0 and 63 points. A total score of 0-7 is interpreted as a "minimal" level of anxiety, 8-15 as "mild", 16-25 as "moderate," and 26-63 as "severe." Findings show the Persian version of BAI has good reliability, validity, and an excellent internal consistency (Kaviani & Mousavi, 2008).

Procedure

To determine the prevalence of adult ADHD in prison inmates, we took three diagnostic steps. First, we assessed the presence of current ADHD symptoms using ASRS. The ASRS was administered in groups of 25 to 50 at a time in a designated room. The first author was present during data collection and explained procedures to the participants. A brief instruction was given orally but was also provided in witting at the beginning of the ASRS. Second, we conducted a retroactive, clinical interview to determine any symptoms of the ADHD during the participants' childhood based on *DSM-IV* criteria; the interview was limited to 257 scored as highly likely to have ADHD based on ASRS. A clinical psychologist, who was well experienced in ADHD, conducted the clinical interviews. Finally, a psychiatrist confirmed his diagnosis through a psychiatric interview.

Because of Al-Fitr religious festival, 54 out of the 257 were granted a pardon or commutation and released from the prison; hence, the study was continued with 203 prison inmates. Of the 203 prison inmates, 147 received ADHD diagnosis through clinical and psychiatric interviews and remained in the study. The psychiatrist conducting interviews to confirm the psychologist's diagnosis of ADHD and comorbid disorders did not use any additional structured and validated interview measures. Next, they were further assessed for any comorbid psychiatric disorders with MCMI-III, BDI-II, and BAI. There was no gap between the assessment steps, which took about 2 months to accomplish.

Results

As stated, among the prison inmates, 147 persons (16.2%) met the full diagnostic criteria for ADHD based on the *DSM-IV*, of whom 54 (36.7%) were of the predominantly inattentive type, 37 (25.2%) were of the predominantly impulsive\hyperactive type, and 56 (38.1%) were of the combined type. The demographic characteristics of the participants are shown in Table 1. Offenders with ADHD had a mean age of 29.8 (SD = 6.01). The ADHD group was slightly younger than the non-ADHD group with a mean age of 31.7 (SD = 8.47), $t_{(905)} = 3.192$, $p < .05$. The mean education level of offenders with ADHD was 7.23 (SD = 2.88), and offenders without ADHD was 8.04 (SD = 2.56). The ADHD group had lower education level than the non-ADHD group, $t_{(905)} = 3.149$, $p < .05$.

Although offenders with ADHD had more unsuccessful marriage than offenders without ADHD, there were no significant differences between offenders with and without ADHD with respect to marital status. However, offenders with ADHD had more punitive history ($\chi^2 = 5.59$, $p < .05$) and committed more violent crimes than offenders without ADHD ($\chi^2 = 1.96$, $p < .05$); the violent crimes included murder, assault and battery, rape and adultery, and abduction.

Table 1. Demographic Characteristics of the Participants and the Results of Significance Tests.

Variable	With ADHD		Without ADHD		*p* value
	F	%	*F*	%	
Marital status					.56
Single	64.00	43.53	325.00	46.03	
Married	60.00	40.82	361.00	51.13	
Divorced	23.00	15.65	76.00	10.76	
Type of crime					.049
Robbery	32.00	21.78	162.00	22.94	
Drug related	55.00	37.41	382.00	54.10	
Murder	15.00	10.20	70.00	9.91	
Assault and battery	18.00	12.24	55.00	7.79	
Mahrieh[a]	9.00	6.12	17.00	2.40	
Rape and adultery	5.00	3.40	15.00	2.12	
Abduction	6.00	4.08	13.00	1.84	
Multiple crimes	7.00	4.76	46.00	6.51	
Punitive history					.018
With history	88.00	59.86	374.00	52.97	
Without history	59.00	40.14	386.00	54.67	

Note. *p* value is based on Pearson's chi-square test.
[a]Mahrieh is an amount of money (but not necessarily) paid by the groom to the bride at the time of marriage (*nikah*) or after.

As stated before, the current study included a comprehensive diagnostic evaluation of comorbid disorders among offenders with ADHD. Comorbidity rates, percentages, and tests of significance for psychiatric disorders in Axis I and II in a group of offenders with ADHD subtypes are summarized in Table 2. We based the analysis presented in Table 2 on ADHD subtypes because evidence suggests that the subtypes may vary in terms of their comorbid psychiatric disorders (e.g., Sprafkin, Gadow, Weiss, Schneider, & Nolan, 2007), especially in regard with cultural issues (e.g., Ghanizadeh, 2009). All ADHD participants showed at least one comorbid disorder, 35.4% of whom fulfilled criteria for two comorbid disorders and 53.7% fulfilled criteria for more than two comorbid disorders on Axis I and II. As Table 2 shows, 85% of offenders with ADHD reported a lifetime history of SUD: 39.8% of whom reported abusing two substances and 29.6% reported abusing three substances at the same time (e.g., narcotics, amphetamines or methamphetamines, and psychoactive drug). Among different types of narcotics, *crack heroin* as the most abused drug, and among psychoactive drugs, *benzodiazepines* (particularly, Clonazepam) were the most abused type among offenders with ADHD. The results suggest that SUD might be the most serious comorbid problem in offenders with ADHD.

Offenders with ADHD were more likely to have comorbid anxiety (55.1%) and mood disorders (40.8%). Furthermore, there was considerable overlap between ADHD and antisocial and borderline personality disorders. In all, 44.2% of offenders with ADHD met criteria for antisocial personality disorder, whereas nearly 21% of offenders with ADHD met criteria for borderline personality disorder. Offenders with ADHD also had a greater risk for comorbid other personality disorders. Approximately 20.4% of offenders diagnosed with ADHD had depressive personality disorder, 9.5% had dependent-, and 26.5% had not otherwise specified personality disorders. The prevalence of negativistic personality pattern was 10.2% among offenders with ADHD.

There were no significant differences among subtypes of ADHD with respect to comorbidity rates psychiatric disorders, except for anxiety disorders and posttraumatic stress disorder (PTSD). As shown in Table 2, there was an increased risk for anxiety disorders and PTSD in predominantly impulsive/hyperactive subtype.

Discussion

The present study included an estimation of ADHD prevalence among adult male prison inmates from central prison of Gorgan, Iran. We estimated a prevalence rate of 16.2% among the prison inmates. The rate was substantially higher than what has been already found in the general population, that is, about 1.1% to 4.4% in different cultures and countries (e.g., Kessler et al., 2006; Park et al., 2011). The rate of prevalence of ADHD among prison inmates was, however, similar to those reported in other countries, for example, 16.3% in Scottish prison population (Young et al., 2009), 19% in Belgium (Vermeiren, De Clippele, & Deboutte, 2000), 18% in a mixed male and female patient group in the USA (Pliszka, Sherman, Barrow, & Irick, 2000), 16.6% in male and 21.4% in female in the USA (Teplin, Abram, McClelland, Dulcan, & Mericle, 2002), 16% in a predominantly male group in the Netherlands (Doreleijers, Moser, Thijs, Van Engeland, & Beyaert, 2000), and 15% in Sweden (Siponmaa, Kristiansson, Jonson, Nyden, & Gillberg, 2001). However, some previous studies from various western countries showed higher prevalence rates for prison inmates with ADHD—for example, in USA, 21.3% in sample of offenders newly sentenced (Westmoreland et al., 2009); in Sweden, 40% in long-term prison inmates (Ginsberg et al., 2010) and 50% in female prison inmates (Edvinsson et al., 2010); in Germany, 45% in young male prison inmates (Rösler et al., 2004); and in Iceland, 30% (Einarsson et al., 2009). Timmons-Mitchell et al. (1997) reported very high prevalence rates in incarcerated juvenile males with 76% and juvenile females with 68% in USA. In Iran, Ghanizadeh et al. (2012) estimated a prevalence rate of 33% in imprisoned teenagers.

The discrepancy in prevalence rates could be accounted for by differences in research methodology (e.g., using different criteria for diagnosis ADHD diagnosis based on

Table 2. The Prevalence and Tests of Significant Differences for Various Types of Psychiatric Comorbidity in Offenders With ADHD Subtypes.

	Predominantly inattentive type (n = 54)		Predominantly impulsive\hyperactive type (n = 37)		Combined type (n = 56)		All (n = 147)		
Disorder	*F*	%	*F*	%	*F*	%	*F*	%	*p*
Mood disorders									
Major depression	4.00	7.40	7.00	18.92	13.00	23.21	24.00	16.33	.073
Bipolar disorder	3.00	5.56	2.00	5.41	2.00	3.57	7.00	4.76	.868
Dysthymia	0.00	0.00	1.00	2.70	2.00	3.57	3.00	2.04	.394
NOS mood disorders	13.00	24.07	3.00	8.11	10.00	17.86	26.00	17.69	.146
Anxiety disorders	16.00	29.63	26.00	70.27	24.00	42.86	66.00	44.90	.001
PTSD	2.00	3.70	8.00	21.62	5.00	8.93	15.00	10.20	.020
Personality patterns and disorders									
Antisocial	22.00	40.74	17.00	45.95	26.00	46.43	65.00	44.22	.810
Borderline	12.00	22.22	10.00	27.03	9.00	16.07	31.00	21.09	.087
Depressive	15.00	27.78	6.00	16.22	9.00	16.07	30.00	20.41	.240
Negativistic	5.00	9.26	4.00	10.81	6.00	10.71	15.00	10.20	.959
Dependent	8.00	14.81	3.00	8.11	3.00	5.36	14.00	9.52	.227
Masochistic	3.00	5.56	0.00	0.00	1.00	1.79	4.00	2.72	.239
Paranoid	3.00	5.56	1.00	2.70	0.00	0.00	4.00	2.72	.201
NOS	10.00	18.51	12.00	32.43	17.00	30.36	39.00	26.53	.239
History of substance abuse	46.00	85.18	34.00	91.89	45.00	80.36	125.00	85.03	.312
Narcotics	10.00	18.51	6.00	16.22	9.00	16.07	25.00	17.01	.933
Cannabis	1.00	1.85	1.00	2.70	0.00	0.00	2.00	1.36	.711
Meth/Amphetamines	1.00	1.85	0.00	0.00	5.00	8.93	6.00	4.08	.060
Narcotics and amphetamines	21.00	38.89	20.00	54.05	24.00	42.86	65.00	44.28	.347
Narcotics and psychoactive medicines	6.00	11.11	4.00	10.81	10.00	17.86	20.00	16.61	.498
Narcotics, amphetamines and psychoactive medicines	7.00	12.96	5.00	13.51	8.00	14.29	20.00	13.61	.731
Cannabis and amphetamines	0.00	0.00	1.00	2.70	1.00	1.79	2.00	1.36	.518
Narcotics and cannabis	3.00	5.56	1.00	2.70	1.00	1.79	5.00	3.40	.532
Alcohol	2.00	3.70	5.00	13.51	6.00	10.71	13.00	8.84	.222

Note. NOS = not otherwise specified; PTSD = posttraumatic stress disorder. Except for history of substance abuse, classifications in the table are based on MCMI-III, BDI-II, and BAI. p value is based on Pearson's chi-square test.

DSM-IV and International Classification of Diseases–Tenth Version [ICD-10]; different gender ratio and mean age in samples, and/or assessment methods) and differences in the cultural settings. Moreover, the common finding of all research is that the prevalence of adult ADHD among prison population is 3 to 15 times higher than what has been reported in the normal population.

Consistent with previous reports (Rösler et al., 2004; Westmoreland et al., 2009), we found high comorbidity rates of adult ADHD with a broad spectrum of psychiatric disorders in prison inmates, including SUD, mood disorders, anxiety disorders, and personality disorders. The SUDs were the most frequent disorders among the prison inmates. Eighty-five percent of offenders with ADHD reported a lifetime history of at least one SUD. The results support findings of Ginsberg et al. (2010), Retz et al. (2007), Rösler et al. (2004), and Westmoreland et al. (2009). There is a difference in the type of abused drugs in various countries due to differences in culture, rules, and the rate of availability. In Western countries, amphetamines and alcohol abuse and/or dependence have the highest rates in adults with ADHD (Barkley et al., 2008; Ginsberg et al., 2010; Westmoreland et al., 2009). However, in the present study, because of culture, religion, and the ease of access, narcotics were the most preferred type of drugs in offenders with ADHD who had lifetime history of SUD (94.5%). Narcotics were mainly abused with other drugs, including amphetamines (44.2%), psychoactive medicines (16%), cannabis (3.4%), and coincident use of amphetamines and psychoactive medicines (29.6%). The amphetamines were the second most widely abused

drug among offenders with ADHD. Amphetamines usually were abused with other drugs, and sheer abuse of this drug had low incidence among offender with ADHD. In recent years, because of easy preparation of amphetamines in local labs and its low prices, the prevalence rate of amphetamine-related disorders has been growing rapidly in Iran (De Leo,[1] 2011). However, there is no effective treatment for amphetamine abuse.

A review by Frodl (2010) indicated that the high comorbidity of ADHD and substance abuse could partly be related to the disorders' common underlying neurobiological substrates. Yet, in another review, Lee, Humphreys, Flory, Liu, and Glass (2011) concluded that ADHD is a strong predictive of substance abuse regardless of the participants' demographic characteristics. The authors also concluded that substance abusers with ADHD may show more craving than substance abusers without ADHD. Therefore, diagnosis and treatment of ADHD may also help reduce craving and relapse rate. Moreover, evidence based on the motivational theory of substance use (Cox & Klinger, 2011) suggests that individuals who do not enjoy their lives due to the lack of contenting goals are at higher risks of resorting to substances to regulate their emotional states. Individuals with ADHD are more likely to fail in perusing their life goals than people without ADHD, a problem which exacerbates their difficulties with emotional regulation (Barkley et al., 2008).

In regard with emotional disregulation, however, our results showed that anxiety and mood disorders listed in Axis I were more common among offenders with ADHD. The result supports previous studies that reported comorbid disorders in offenders with ADHD. For example, Einarsson et al. (2009), Gudjonsson, Wells, and Young (2011), and Westmoreland et al. (2009) reported that the prevalence of anxiety and mood disorders in offenders with ADHD were higher than offenders without ADHD. The comorbidity of ADHD and anxiety and mood disorders has also been noted in studies of ADHD in the general population (Kessler et al., 2006; Murphy & Barkley, 1996; Park et al., 2011). The current study showed that there was an increased risk for anxiety disorders and PTSD in predominantly impulsive/hyperactive subtype. Of course, the high prevalence rate may simply result from an overlap between the diagnostic criteria of hyperactivity and anxiety (e.g., restless, fidget or squirm with hands and feet, instability).

In Axis II, comorbid antisocial and borderline personality disorders were significantly more common in offenders with ADHD (44.2% and 21%, respectively). Prior studies have also observed an increased risk for antisocial and borderline personality disorder in adults with ADHD in prison population (Westmoreland et al., 2009; Young et al., 2009). The association between ADHD and personality disorders has also been observed in the general population (Mannuzza et al., 1993; Weiss et al., 1995). In a follow-up study of Mannuzza et al. (1993), ADHD patients were nearly 10 times as likely as controls to have antisocial personality disorder. According to Fischer, Barkley, Smallish, and Fletcher (2002), the association between ADHD and personality disorders could be related to the core feature of personality disorders (defined as deviant patterns of behavior in two of the following: cognition, emotions, interpersonal functioning, and impulse control) and deviance from the norm that are needed for the diagnosis of ADHD.

Although antisocial personality disorder was more common among the prison inmates in the present study, 55.8% of offenders with ADHD did not meet criteria for antisocial personality disorder. The finding shows that ADHD alone and at the absence of comorbid antisocial personality disorder can be associated with criminal behavior and SUD in adulthood.

The study about comorbid disorders may propound a question of whether successful treatment of adult ADHD would influence comorbid disorders. There is evidence from the Multimodal Treatment Study of ADHD that successful treatment of childhood ADHD reduces childhood symptoms of comorbid disorders (Jensen et al., 2001). Likewise, indirect evidence suggests that stimulant treatment of childhood ADHD might reduce subsequent risk of SUD (Biederman, 2003). Therefore, it can be hypothesized that treatment of adult ADHD may have some effects on the severity or persistence of comorbid disorders. Future research with experimental methods is needed to resolve this uncertainty.

In summary, the present study indicated that ADHD is a prevalent disorder among adult prison inmates. Offenders with ADHD are more likely to report poorer mental health, marital relationship, and educational level. They are also more likely to report higher comorbid psychiatric disorders, unsuccessful marriages, and violent crimes compared with other prison inmates. Offenders with ADHD are likely to require more intensive mental health services. The findings highlight the necessity of appropriate treatment protocols for ADHD in correctional settings. Therefore, we suggest that the treatment protocols also address disorders that commonly comorbid with ADHD and ways of dealing with them.

Because it is often difficult to monitor symptoms of ADHD during confinement and many of the medications, especially stimulants used to treat ADHD, have significant street value and abuse potential, there are compelling reasons to use nonstimulant medications (such as Bupropion, Atomoxetine, or Tricyclic antidepressants) as first-line agents for this population despite their other limitations (Appelbaum, 2008; Barkley, 2006). A variety of nonpharmacologic treatments may also be useful in treating the disorder. Education about the disorder can help ease frustration, enhance self-esteem, and teach organizational skills. Group

therapy with other inmates who have ADHD can have similar benefits (Appelbaum, 2008). Cognitive behavioral therapy and executive functions training may also be helpful in assisting patients to challenge their cognitive distortions, enhance cognitive control, and modify dysfunctional behaviors (Rapport, Chung, Shore, & Isaacs, 2001), particularly in the setting of psychiatric comorbidity (Rostain & Ramsay, 2006). Evidences show that executive functions training may also be effective in improving core cognitive deficits underlying ADHD and hence improve ADHD symptoms (S. J. Beck, Hanson, Puffenberger, Benninger, & Benninger, 2010).

There are several limitations to this study. First, because the participants were recruited from closed parts of Gorgan Prison and consisted of only male prison inmates, the results may not generalize to whole population of the prison inmates, to probationers, or to parolees. Second, the ADHD diagnosis was based on ASRS; the validity of the test has not been adequately determined for Iranian population. However, a recent study reported high convergent validity for the scale with ADHD problem subscale of Achenbach System of Empirically Based Assessment (ASEBA) self-report form (Hamzeloo, Mashhadi, & Bafandeh, 2011). Finally, although we used self-report instruments and clinical interview for the diagnosis of ADHD and comorbid psychiatric disorders, some degrees of overreporting of symptoms of mental illness could happen.

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Author Biographies

Mohammad Hamzeloo, MSc (in clinical psychology from Ferdowsi University of Mashhad), is a counselor of Golestan State Prisons Research Council. His research interests include assessment and treatment of psychiatric disorders in prison inmates, particularly pervasive developmental disorders and substance use disorders.

Ali Mashhadi, PhD, is an assistant professor of psychology at Ferdowsi University of Mashhad. His current interests include executive cognitive functions and treatment methods for children, adolescents, and adults with ADHD.

Javad Salehi Fadardi, PhD, is an associate professor of psychology at Ferdowsi University of Mashhad. His research interests include motivational and cognitive processes underlying various psychopathologies and health-related behaviors.