

Original article

Association of Attention Deficit Hyperactivity Disorder with Heroin Addiction

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Abstract:

Objectives: To study the association of attention-deficit hyperactivity disorder (ADHD) with heroin addiction. **Study design:** A cross-sectional, hospital based study. **Place and duration of study:** The study was carried out at Lady Reading Hospital and Khyber Teaching Hospital, Peshawar, Pakistan from 4th April 2012 to 13th September 2012. **Subjects and Methods:** A sample of 137 adult heroin addicts were analyzed that whether they were ADHD and that childhood problem continues to manifest symptoms in adults. For retrospective assessment of childhood ADHD, the Wender Utah Rating Scale (WURS) as well as the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) symptom checklist for ADHD was used. The Conners' Adult ADHD Rating Scales (CAARS) was used to assess the persisting symptoms of ADHD in adults. **Inclusion criteria:** Patient diagnosed with heroin addiction according to ICD-9 and DSM-IV. **Exclusion criteria:** Patient has co-morbid with any other mental illnesses. **Results:** The difference between the mean score of WURS and CAARS of ADHD patients were significantly greater than the normal patients. Heroin addicts showed 41.6% (WURS) and 38.6% (DSM-IV diagnostic criteria) that indicated evidence of retrospective ADHD affliction in childhood. 22.6% were IV users. CAARS was presented in 37.9% heroin addicts who exhibited a substantiation of ADHD persistent in adulthood. The difference between the mean score of WURS and CAARS of ADHD patients were significantly greater (P = 0.003), than the normal patients. **Conclusions:** These results revealed that addiction is associated with co-morbidity with ADHD, expressed in the form of heroin addiction.

Key words: Attention-deficit hyperactivity disorder, heroin addiction, Wender Utah Rating Scale, Conners' Adult ADHD Rating Scale.

DOI: <http://dx.doi.org/10.3329/bjms.v13i2.18294>

Bangladesh Journal of Medical Science Vol.13(2) 2014 p.128-134

Introduction:

The attention deficit hyperactivity disorder (ADHD) is one of the most common neuropsychiatric childhood onset disorders that affect 3% to 6%¹ and almost 5% of adults² and personality characteristics and diseases, such as novelty-seeking personality, substance abuse, and heroin addiction, whose features are similar to ADHD or are associated with ADHD³.

Its prevalence in school children is approximately 6% to 9% and etiology of this disorder is unknown⁴. There was a myth for many years that the disorder remits during adolescence, but it is now well established that it can be experienced by a patient in adulthood as well. There is a bidirectional overlap between ADHD and drug abuse and dependence⁵ and affect 27% of adult population⁶.

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The co-occurrence of ADHD and addiction is very common. Previous studies have shown that adults with ADHD are a risk for substance use disorder (SUD) and almost 52% of adult had a lifetime history of SUD^{2,4}. The co-morbidity between ADHD and SU shows relativity and relevant to research and clinical development in psychiatry, pediatrics and psychology⁶. The diagnosing and specific risk factor associated with SU within ADHD may lead to a better targeted pharmacotherapy and psychotherapeutic treatments for both the disorders upon expression at early stage of their lives^{8,9}. Higher rates of ADHD have been reported in patients having SUD relative to controls^{10,11}. 15% to 25% adults with SUD history have been estimated to have ADHD¹².

Studies have conducted in juvenile adolescents for assessing ADHD and other disorders in substance abusing groups had overrepresentation of ADHD^{11,12}. ADHD predominates from 15% to 25% in individuals with SUD^{13,14}. Two studies showed that the 24% of 201 inpatients¹⁵ and 10% cocaine abusers for drug detoxification treatment had ADHD¹⁶. The treatment of ADHD is usually done with stimulants like methylphenidate, amphetamine etc., with the behavioral therapy of the patient and family counseling. Biederman and colleagues demonstrated that untreated ADHD is a risk factor for the development of an SUD⁵. Wilens¹⁴ drew the conclusion that a pharmacological treatment had no negative influence on SUDs in ADHD patients.

Various studies have shown that a treatment of addicted ADHD patients with stimulants reduces drug consumption^{16,17}. Adolescents medicated with stimulants showed a lower risk of developing an addiction (cocaine, alcohol and other drugs). In our previous study, we demonstrated that many substance-dependent patients like THC (tetra-hydrocannabinol), poly drug, alcohol and opium abuse were suffered because of ADHD or were adult ADHD¹⁷.

Material and Methods:

One hundred and thirty seven consecutive patients admitted in Psychiatry ward of LRH for drug detoxification were included in the study. All the patients were analyzed through an extended clinical semi-structured interview to collect socio-demographic, drug use related, clinical data and also the non-ADHD psychiatric diagnoses were assessed in both the hospitals by the use of a semi structured diagnos-

tic interview previously validated against the Structured Clinical Interview for DSM-IV-TR¹³⁻¹⁵. Patients evaluated in the hospitals were also assessed for ADHD, using DSM-IV criteria and a structured interview provided by J. Biederman, M.D.^{2,5}.

Adult patients with various drug and alcohol dependence gave their consent to participate in this study as in-patients at the Department for Addiction Lady Reading Hospital. At a clinical interview, all 137 patients (all males) met the diagnostic criteria required for heroin according to Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), and were permitted to participate in this investigation. The examination was performed only after a 10-day detoxification therapy as it was imperative that the patients were no longer suffering from any withdrawal symptoms. Exclusion criteria included other illnesses. Approval for this study was given by the Ethics Committee of Lady Reading Hospital.

The Wender Utah Rating Scale (WURS) and the DSM-IV symptom checklist for ADHD served as investigating instruments for the retrospective assessment of the presence of ADHD in childhood. Furthermore, the DSM-IV criteria were used to divide the patients into diagnostic sub-groups (inattentive type, impulsive type, combined type). The Conners' Adult ADHD Rating Scales (CAARS, Short Version) (Conners et al., 1999) were used to assess persisting ADHD symptoms in adulthood as a part of a comprehensive intake valuation battery.

Statistical Analyses:

We analyzed demographic differences between groups, using chi-square tests for categorical variables and comparisons of proportion and for the comparison of proportions. The unpaired t-test was used to compare means between two groups. The unpaired t-test was used to compare means between two groups; 61.3%, patients with ADHD showed a marked tendency towards substance abuse when compared to those patients without ADHD (38.7%) ($P = 0.003$). A principal components analysis using varimax rotation was performed on the 25 test items of WURS and 25 items of CAARS-S. The number of factors retained was determined by examination of the screen plot and use of the Kaiser-Guttman rule (i.e., eigenvalues greater than 1.0). Cronbach's alpha was calculated as a measure of internal consistency on all the items of WURS and CAARS-S resulting from the factor analysis in Wender Utah and Conners rating scales.

Results:

The total sample comprised of 137 male patients with an average age groups of 37.5 ± 9.8 years. The socio-demographic data have been presented (Table 1). The mean score of 61-items of WURS and 26-items of CAARS-S were calculated but we arbitrarily chose 25-items of WURS and 25-items of CAARS-S showing the greatest mean difference between the patients of ADHD and normal.

Table 1: Socio-demographic data of the patients.

Socio-demographics	ADHD
Number of Patients, n	137
Males/Females, n	137/Nil
Age (Mean \pm SD)	37.5 ± 9.8
Employed n (%)	61 (44.5)
Married n (%)	37 (27)
Divorced n (%)	11 (8.02)

Total IV-users in the sample were 31 and affected were 21 (67.7): HBV 5 (23.8%), HCV 13 (61.9%), and HIV 3 (14.2%) respectively. Their distribution in different addiction is shown. (Table 2)

Table 2: Total IV users in the sample (n=31, affected n=21).

Types of Indications	No.	%age	Heroin users
HBV	5	23.8%	Present N=3
HCV	13	61.9%	Present N=7
HIV	3	14.2%	Present N=1
Total N (%)	21	100% approx.	11(52.3)

Heroin addicts showed 41.6% (WURS) and 38.6% (DSM-IV diagnostic criteria) indicated evidence of retrospective ADHD affliction in childhood. CAARS was presented in 37.9% heroin addicts. Scree-test and eigenvalues greater than one, exclusion of factor loadings less than 0.30, factors loading greater than 0.30 not on more than one factor. A varimax rotation yielded the four factors:(1) inatten-

tion/memory problems, (2) hyperactivity/restlessness, (3) impulsivity/emotional liability, and (4) problems with self-concept²⁹ Additionally, an ADHD index and indices for DSM-IV subscales (DSM-IV: predominantly inattentive, predominantly hyperactive-impulsive, combined sub-type) can be obtained¹¹. Test-retest correlations range between 0.81 (impulsivity/emotional liability) and 0.88 (problems with self-concept). Construct-validity with WURS reached moderate to satisfying correlations of 0.31 (inattention problems) to 0.68 (impulsivity/emotional liability). Criterion validity with a semi-structured interview for adult ADHD yielded a sensitivity of 81% and a specificity of 83% 33.52 (47.2%) of the patients achieved the cut-off ≥ 50 in the WURS-k and, therefore, fulfilled the criteria for ADHD symptoms in childhood.

The correlation matrix was subjected to principal axis factoring, yielding 11 factors with eigenvalues greater than 1.0. Connors et al. decided on an orthogonal rotation to obtain independent factors of inattention, hyperactivity, and impulsivity. Since it is unlikely that these three dimensions are totally unrelated, we did not limited our analyses to varimax rotation, but also used oblique rotations. Items were eliminated from further analyses if they failed to load above 0.30 on any one factor, or if they loaded greater than 0.30 on more than one factor.

The first factor accounted for 12.91% of the total variance. The eight items that loaded on this factor were related to inattention/distractability ($\alpha = 0.82$). The second factor explained 8.12% of the total variance. The five items loading on that factor tapped on problems with self-concept ($\alpha = 0.75$). The third factor accounted for 4.82% of the variance and the four items loading on it are related to emotional instability ($\alpha = 0.77$). The fourth factor explained 4.27% of the total variance with six items related to impulsivity ($\alpha = 0.71$). Five items loaded on the fifth factor that explained 2.25% of the total variance, tapping on hyperactivity ($\alpha = 0.87$). The sixth factor accounted for 2.36% of the total variance and the six items loading on it are related to sensation seeking ($\alpha = 0.67$).

Table 3: Attention deficit hyperactivity disorder diagnosed with Wender Utah Rating Scale (WURS), DSM-IV symptom check-list for ADHD and Conners' Adult ADHD Rating Scales (CAARS).

Heroin addicts n=137	Frequency	Percent
DSM-IV-TR*	53	38.6
Inattentive type	6	11.3
Hyperactive-impulsive type	27	50.9
Combined type	20	37.7
WURS**	57	41.6
CAARS***	52	37.9
Inattentive type,	5	9.6
Hyperactive-impulsive type	25	48.07
Combined type	19	36.5
Indistinct type	3	5.7

*WURS = The Wender Utah Rating Scale (WURS) indicates ADHD with a score of more than 30.

**CAARS = Conners Adult ADHD Rating Scales (the analysis is conducted to indicate subject's current state).

***DSM-IV = Diagnostic and Statistical Manual of Mental Disorders (a score higher than six in the first nine items indicates attention problems: a score higher than six in the last nine items indicates hyperactivity).

Discussion:

This study comprised of sample of adults admitted in psychiatry ward seeking detoxification treatment for heroin addiction were studied that whether they were ADHD in childhood and this disorder is persisting in adulthood or not. Results of this study suggest that the four factors: inattention/memory problems, hyperactivity/restlessness, impulsivity/emotional liability, and problems with self-concept characterize the WURS and CAARS-S. These four factors are found in both the retrospective childhood and the adult assessment in the corresponding instruments. These factors helped: in distinguishing ADHD from non-ADHD, associate patients with a clinical diagnosis of drug and alcohol addiction comorbid with ADHD, and do better to identify adults who do not have ADHD. In addition to poor speci-

ficity of WURS,³¹ the underlying factor structure suggests that WURS can measure depression and conduct problems, which are not specific to the DSM-IV ADHD classification. Another possible reason for the low specificity of the WURS may be a response bias on the part of patients evaluated in an ADHD specialty clinic; this is more probable in adult patients, who are unlikely to have parents available as informants regarding childhood behavior. Other studies of symptom clusters in children with ADHD support two factors: inattention and hyperactivity-impulsivity^{32,33}.

The finding that these four factors are the best discriminator in adults is consistent with the evolution of ADHD over the lifespan from mixed to more predominantly inattentive and hyperactive. This finding also highlights that the cognitive symptom domain is perhaps the most important to consider when evaluating a general psychiatric population for presence of ADHD. Our investigations showed significantly high values for the hyperactive and the combined types. The isolated inattentive type was under-represented. The over-representation of the hyperactive type in this group reflects those individuals willing to take on a higher risk. Patients categorized under the inattentive type most likely use the substance primarily for recreational purposes and later on became dependent.

The results of this study confirm that a high percentage of the drug and alcohol-dependent patients admitted in psychiatry fulfilled the diagnostic criteria of DSM-IV for the presence of ADHD.

The highest rate of ADHD was in children born to mothers with heroin dependency raised at home, being twice that observed in the other groups. Mothers of these groups of children also had a high rate of ADHD³⁴.

One study suggests that cyclothymic, and to a lesser extent irritable traits could represent the temperamental profile of heroin addicts, largely irrespective of co-morbidity, and tend to cohere with previous conceptualizations hypothesizing sensation-seeking as the main personality characteristics of addiction³⁵.

Kessler et al. (2006) found quite a high prevalence of ADHD in alcohol addicts of 4.4%. Our study found a rather moderate rate of persisting ADHD in the entire examined group of alcohol-dependent patients. However, according to our data concerning the prevalence in childhood, ADHD can represent a considerable risk factor for the onset and develop-

ment of heroin and other drug dependence as well. Furthermore, those patients with ADHD were much more likely to commence with drugs at an early age, so ADHD can be considered to be a risk factor for 'early introduction' to drug addiction. Pre-clinical investigators (Fung and Lau, 1989) hypothesized that early exposure to nicotine may result in neuronal sensitization and initiation, pre-disposing to later behaviors linked to SUD. From a preventive standpoint, reducing the manifest psychiatric symptoms, such as in ADHD, may result in a decrease in cigarette consumption as well. Findings also indicate that ADHD accelerates the transition from substance abuse to substance dependence (Biederman et al., 1998). There is also evidence that ADHD increases the risk of drug use disorders in those individuals with alcohol abuse or dependence (Biederman et al., 1998). ADHD is also known to affect remission from SUD. A study was carried out with 130 adults with ADHD and SUD and 71 non-ADHD adults with SUD, and the results showed that the average time to SUD remission was more than twice as long in ADHD patients than in the control subjects (144 vs. 60 months, respectively) (Wilens et al., 1998). Studies performed on ADHD patients suggest that persisting ADHD can lead to continued misuse and abuse of substances following dependence, a longer duration of SUD and a lower rate of remission (Biederman et al., 1998; Wilens et al., 1998). In summary, these findings indicate that ADHD influences the initiation, transition and recovery from SUD. The high coincidence of ADHD and addiction illnesses may also be due to a number of other causes. In particular, ADHD patients suffering from hyperactivity and disturbed control impulses and patients of the combined type are known to derive a higher level of pleasure from experimentation and risk-taking concerning drugs and alcohol. It was found that hyperactive ADHD patients with drug dependence

were more likely to have an additional other addictions compared to those patients with just attention disorders (Saules et al., 2003).

Conclusion:

It was confirmed that ADHD forms an association with heroin addiction and that many patients suffering from an addiction may also have co-morbid ADHD. With the help of CAARS, it could be demonstrated that a significant number of patients who fulfilled the diagnostic criteria of ADHD, according to DSM-IV, had persisting ADHD in adulthood. An ADHD patient poses a marked risk for the development of different types of addictions.

Limitations:

Some limitations have to be taken into account that when doing psychometrics on a scale, generally the sample of subjects chosen to complete the scale should be similar to the population; the scale was written for. In this case, the intended population in adults with ADHD, but this study sampled from a normal distribution, thus psychometric statistics generated are biased by properties of the sample. Even though we assessed a large sample, this is not normative for the whole Pakistani population due to convenience and consecutive sampling. Another limitation of this study was that there were only male participants.

There should also be comparison of self-ratings on the CAARS with performance on the Conners Continuous Performance Test (CPT-II) for further validation. Although we cross checked the information told by the patients but still the responses on the CAARS-S should also be cross-validated with ratings from close associates, friends or family members (CAARS-O).

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