

An observational study of the characteristics of different substance-use disorder subtypes combined with adult attention deficit hyperactivity disorder

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Aim

The aim of this study was to examine the characteristics and intensity of the association between various subtypes of substance-use disorders (SUD) with adult attention deficit hyperactivity disorder (ADHD) and compare this with the progression of substance use in those without ADHD.

Participants and methods

The study was conducted at the Psychiatric Department, Mansoura University Hospital. Both inpatients and outpatients who screened positive for any one of the substances such as alcohol, opioids, amphetamine, or cannabis were approached to enter the study. Out of these, patients who gave informed consent, satisfied the inclusion and exclusion criteria, and met the DSM-IV-TR diagnosis for SUD for dependence or abuse entered the study and completed the patient intake form. A total of 100 such consecutive patients were screened for symptoms of adult ADHD by administering the first six questions of part A of the Arabic version of the adult ADHD self-report scale-VI.I (ASRS-VI.I) symptom checklist. Only the first six questions that are found to be the most predictive of symptoms were included for screening. Patients who answered positive for four or more questions were further interviewed using the Diagnostic Interview of Adult ADHD to make a diagnosis of adult ADHD in these patients. A total of 97 patients completed all parts of study questionnaire. The patients were divided and grouped depending on the type of substance abused, alcohol, opioid, cannabis, amphetamine, or polysubstance, and whether or not they had comorbid adult ADHD. The results obtained were statistically analyzed using SPSS software.

Results

The prevalence and course of SUD combined with adult ADHD differed depending on the primary substance of abuse. Cannabis and alcohol users had a higher percentage of adult ADHD (36.4 and 33.3%, respectively) compared with other drug users. Cannabis had the earliest age of onset of SUD at 15 years of age. Cannabis and amphetamine had a prolonged duration of abuse: 14.87 and 14.7 years, respectively. Similarly, they had a greater number of hospitalizations (3.82 and 3.88 times, respectively) and an increased duration of stay in the hospital (166.67 and 110 days, respectively) as compared with other drugs. Polysubstance, cannabis, and amphetamine abusers had more relapses: 3.27, 3.36, and 3.38 times, respectively.

Conclusion

The percentage of ADHD differs among different subgroups of SUD depending on the primary substance of abuse. Cannabis and amphetamine have a higher comorbidity, an earlier age of onset, and a more protracted course of SUD in ADHD patients compared with other drugs.

Keywords:

ADHD, ASRS, DIVA, SUD

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Introduction

Studies show a higher prevalence of adult attention deficit hyperactivity disorder (ADHD) in adults with substance-use disorders (SUD) compared with the general population (Rounsaville and Carroll, 1991; Levin *et al.*, 1998; King *et al.*, 1999; Wilens, 2007; Arias *et al.*, 2008; Ohlmeier *et al.*, 2008; Huntley *et al.*, 2012). This is an important observation because research suggests that co-occurring ADHD and

SUD is associated with a more severe course of substance use and a poorer treatment outcome (Carroll and Rounsaville, 1993; Wilens and Fusillo, 2007).

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Prevalence rates of ADHD in SUD patients show an enormous variation ranging from 2% in substance-abusing Icelandic adolescents (Hannesdottir *et al.*, 2001) to 83% in Japanese methamphetamine and inhalant abusers. In a recent meta-analysis by Van Emmerik-van Oortmerssen *et al.* (2014) of 12 studies on adult seeking SUD patients, the pooled ADHD prevalence rate was 23.3%, ranging from 10.0 to 54.1% in individual studies. The possible explanations for this huge variability include differences in diagnostic criteria, the primary drug of abuse, country-specific factors, the treatment setting, clinical biases, and demographic factors. However, the relative effect of each of these factors has not been studied (Van de Glind *et al.*, 2014).

Also, there are conflicting data on the kind of primary substance of abuse that was more prevalent and had more impact on the course of progression of SUD combined with adult ADHD. According to one study, the prevalence is lower among treatment-seeking SUD patients whose primary substance of abuse was alcohol, compared with those whose primary substance of abuse was illicit drugs (Van de Glind *et al.*, 2014). Another study states that there is a lower prevalence of adult ADHD in treatment-seeking cocaine-dependent patients compared with treatment-seeking alcohol-dependent and opioid-dependent patients (Van Emmerik-van Oortmerssen *et al.*, 2012). As there was little information about these issues, we decided to conduct a preliminary analysis of the relationship between the primary drug of abuse in SUD and their course when they were comorbid with adult ADHD.

Furthermore, we decided to test our hypothesis that the prevalence and course of SUD combined with adult ADHD did not vary depending on the primary substance of abuse.

Participants and methods

Participants

The study was conducted from February to August 2015 and was approved by the Ethical Committee. Patients

attending the outpatient and inpatient unit at the Psychiatric Department, Mansoura University Hospital, who screened positive for one or more of the substances such as alcohol, opioids, amphetamine, and cannabis were approached to participate in the study. Written informed consent was obtained from all participants. The patients were interviewed by a trained professional, and those who satisfied the inclusion and exclusion criteria, aged between 18 and 65 years, with a current DSM-IV-TR diagnosis of SUD entered the study. Exclusion criteria included any severe mental or neurological disorders such as psychosis, affective disorders, dementia, or Parkinson's disease. A total of 100 consecutive patients were enrolled in the study and were requested to complete all parts of the patient intake form, which consisted of demographic data, details regarding their substance use, and screening questions for adult ADHD from the Arabic version of the adult ADHD self-report scale (Kessler *et al.*, 2005b). The patients were further subjected to a Diagnostic Interview for Adult ADHD (DIVA) to make a final diagnosis. Out of 100, 97 patients completed all parts of the study. Three patients dropped out due to the nonavailability of an informant to complete DIVA and due to physical health reasons.

Screening for substance abuse

Alcohol was measured by the enzymatic method by oxidation to acetaldehyde with NADH⁺, a reaction catalyzed by alcohol dehydrogenase (Dubowski and Caplan, 1996).

To assess opiate, cocaine (benzoylecgonine), and amphetamine qualitatively in urine, an initial immunoassay screening test was carried out, with cutoff values of 300, 300, and 500 ng/ml, respectively, and a confirmatory test of gas chromatography-mass spectroscopy was performed if needed (Kwong *et al.*, 1988).

For opiates, urine is treated first with acid to hydrolyze the glucuronides and then with hydroxylamine, and then extracted with a solid-phase extraction column. For cocaine, derivatives of benzoylecgonine after extraction from urine were analyzed with a deuterated internal standard in the selected ion-monitoring mode.

Table 1 Age of onset

	ADHD	Non-ADHD	P
Alcohol	18.6±2.11 (17–23)	34.21±7.86 (20–47)	0.465
Cannabis	15±1.49 (17–23)	32.73±3.56 (28–38)	0.026*
Opioid	21.17±3.25 (17–25)	32.0±3.54 (27–37)	0.465
Amphetamine	21.2±2.23 (19–23)	33.39±3.95 (28–40)	0.465
Polysubstance	20.22±2.16 (17–23)	33.39±3.95 (28–40)	0.465
	0.324	0.872	

ADHD, attention deficit hyperactivity disorder. *Signifies the level of significance.

Assessment measures

Screening for adult ADHD was performed by the Arabic version of the adult ADHD self-report scale-VI.I (ASRS-VI.I) symptom checklist. Only the first six questions, which are found to be the most predictive of symptoms, were included for screening (Fayyad *et al.*, 2007; Kessler *et al.*, 2007).

DIVA 2.0 is a structured interview for ADHD in adults (Kooij *et al.*, 2005, 2008). It is divided into three parts that are each applied to both childhood and adulthood: the criteria for attention deficit (A1), the criteria for hyperactivity-impulsivity (A2), and the age of onset and impairment accounted for by ADHD symptoms. The patients were diagnosed as having adult ADHD if they scored 6 or more in each of the symptom domains of attention deficit (A) and hyperactivity-impulsivity in childhood and during adult life with evidence of a lifelong persistent course with impairment in at least two situations, given that these symptoms are not explained by another psychiatric disorder.

Table 2 Duration of substance abuse

	ADHD	Non-ADHD	P
Alcohol	10.27±5.9 (3–20)	8.5±6.46 (1–17)	0.945
Cannabis	14.87±5.73 (5–20)	3.27±2.17 (2–10)	0.045*
Opioid	4.67±2.33 (1–8)	2.78±1.09 (1–4)	0.459
Amphetamine	14.7±4.17 (8–20)	3.04±1.36 (2–5)	0.459
Polysubstance	12±5.41 (5–20)	2.78±1.09 (1–4)	0.359
	0.0243*	0.046*	

ADHD, attention deficit hyperactivity disorder. *Signifies the level of significance.

Table 3 Average number of hospitalization

	ADHD	Non-ADHD	P
Alcohol	1.5±0.8366 (1–3)	2.66±0.82 (1–3)	0.403
Cannabis	3.82±1.89 (1–7)	1.25±0.7 (1–3)	0.023*
Opioid	2±1 (1–2)	1.25±0.5 (1–2)	0.403
Amphetamine	3.88±1.96 (2–7)	1.33±0.61 (1–3)	0.103
Polysubstance	2.8±1.9 (1–7)	1.25±0.5 (1–2)	0.103
	0.065	0.074	

ADHD, attention deficit hyperactivity disorder. *Signifies the level of significance.

Table 4 Hospitalization days

	ADHD	Non-ADHD	P
Alcohol	53.5±62.72 (20–180)	101.67±44.0 (20–120)	0.456
Cannabis	166.67±37.75 (40–200)	63.75±38.89 (30–150)	0.056
Opioid	53.33±32.15 (30–90)	43.33±11.55 (30–50)	0.456
Amphetamine	110±44.7 (50–200)	58.67±19.95 (30–100)	0.156
Polysubstance	89.4±55.52 (21–200)	43.33±11.55 (30–53)	0.156
	0.0438*	0.0484*	

ADHD, attention deficit hyperactivity disorder. *Signifies the level of significance.

Statistical analysis

Statistical analyses were performed using the IBMSPSS (United States- 2004) 23 program and methods according to Landau and Everitt (2004).

Results

Description of the studied patients

Out of the 97 patients who completed the study, 27 had adult ADHD. These 27 patients were separated and grouped depending on the primary substance of abuse and compared with their non-ADHD counterparts and also among themselves.

On comparison with non-ADHD patients, patients abusing cannabis and alcohol had a higher percentage of adult ADHD at around 36.4–33.3%. In contrast, the percentage of opioid users was 25%. The percentage of amphetamine and polysubstance abusers were 21.4% each.

The age of onset of all subtypes of SUD was much earlier if they had a dual diagnosis, that is, adult ADHD compared with those who did not have ADHD. The adult ADHD group started drug abuse about 10 years earlier and during the adolescent years of their life. Among the drugs, cannabis had the earliest age of onset, approximately at 15 years of age (Table 1).

All patients with ADHD had a longer duration of abuse than non-ADHD patients, irrespective of their primary drug of abuse. Cannabis and amphetamine had a prolonged duration compared with opioid and alcohol: 14.87 and 14.7 years, respectively (Table 2).

Except for alcohol, all other drugs had on average more number of hospitalizations when they were comorbid with adult ADHD. Cannabis and amphetamine abusers had 3.82 and 3.88 times the number of hospital admissions compared with 2.81, 2, and 1.5 in polysubstance, opioid, and alcohol abusers (Table 3).

All primary drugs of abuse except alcohol, when combined with ADHD, had a longer duration of stay in hospitals. The stay was the longest for cannabis users

(about 166.67 days) and amphetamine users (around 110 days) compared with other drug abusers (Table 4).

Similarly, all drug abusers had a greater number of relapses except for alcohol users in patients with adult

ADHD. Cannabis, amphetamine, and polysubstance abusers had 3.36, 3.38, and 3.27 times the number of relapses, which is greater than that with opioids (Table 5 and 6).

Table 5 Average relapse time

	ADHD	Non-ADHD	P
Alcohol	1.91±1.044 (1-3)	2.21±1.25 (1-5)	0.876
Cannabis	3.36±1.86 (1-7)	1.25±0.7 (1-3)	0.036*
Opioid	2±1 (1-2)	1.33±0.58 (1-2)	0.876
Amphetamine	3.38±1.06 (2-5)	1.31±0.63 (1-2)	0.106
Polysubstance	3.27±1.95 (1-7)	1.33±0.58 (1-2)	0.106
	0.056	0.097	

*Signifies the level of significance.

Discussion

Our study showed that among SUD patients with ADHD, 36.4% abused cannabis, which was the highest among ADHD patients. This was followed by alcohol and amphetamine. This is consistent with the study conducted by Biederman *et al.* (1995), who reported that the drug most commonly used by ADHD patients was cannabis, at a frequency much greater than

Table 6 Correlation studies

	ADHD	Non-ADHD	P
Alcohol subgroup			
N (%)	7 (33.3)	14 (66.7)	0.854
Age of onset of abuse (years)	18.6±2.11 (17-23)	34.21±7.86 (20-47)	0.465
Duration of abuse (years)	10.27±5.9 (3-20)	8.5±6.46 (1-17)	0.945
Average number of hospitalization	1.5±0.8366 (1-3)	2.66±0.82 (1-3)	0.403
Average period of hospitalization (days)	53.5±62.72 (20-180)	101.67±44.0 (20-120)	0.456
Average relapse time	1.91±1.044 (1-3)	2.21±1.25 (1-5)	0.876
Total duration of abstained days	77.5±21.87 (50-110)	102.5±27.65 (50-150)	0.671
Cannabis subgroup			
N (%)	8 (36.4)	14 (63.6)	-
Age of onset of abuse (years)	15±1.49 (17-23)	32.73±3.56 (28-38)	0.026*
Duration of abuse (years)	.87±5.73 (5-20)	3.27±2.17 (2-10)	0.045*
Average number of hospitalization	3.82±1.89 (1-7)	1.25±0.7 (1-3)	0.023*
Average period of hospitalization (days)	166.67±37.75 (40-200)	63.75±38.89 (30-150)	0.056
Average relapse time	3.36±1.86 (1-7)	1.25±0.7 (1-3)	0.036*
Total duration of abstained days	96.36±6.74 (80-100)	55±20 (30-100)	0.371
Opioid subgroup			
N (%)	3 (25)	9 (75)	0.0554
Age of onset of abuse (years)	21.17±3.25 (17-25)	32.0±3.54 (27-37)	0.465
Duration of abuse (years)	4.67±2.33 (1-8)	2.78±1.09 (1-4)	0.459
Average number of hospitalization	2±1 (1-2)	1.25±0.5 (1-2)	0.403
Average period of hospitalization (days)	53.33±32.15 (30-90)	43.33±11.55 (30-50)	0.456
Average relapse time	2±1 (1-2)	1.33±0.58 (1-2)	0.876
Total duration of abstained days	83.33±5 (80-90)	50±16.33 (30-70)	0.671
Amphetamine subgroup			
N (%)	6 (21.4)	22 (78.6)	0.054
Age of onset of abuse (years)	21.2±2.23 (19-23)	33.39±3.95 (28-40)	0.465
Duration of abuse (years)	14.7±4.17 (8-20)	3.04±1.36 (2-5)	0.459
Average number of hospitalization	3.88±1.96 (2-7)	1.33±0.61 (1-3)	0.103
Average period of hospitalization (days)	110±44.7 (50-200)	58.67±19.95 (30-100)	0.156
Average relapse time	3.38±1.06 (2-5)	1.31±0.63 (1-2)	0.106
Total duration of abstained days	92.5±13.89 (60-100)	59.23±18.47 (50-100)	0.271
Polysubstance subgroup			
N (%)	3 (21.4)	11 (78.6)	0.095
Age of onset of abuse (years)	20.22±2.16 (17-23)	33.39±3.95 (28-40)	0.465
Duration of abuse (years)	12±5.41 (5-20)	2.78±1.09 (1-4)	0.359
Average number of hospitalization	2.8±1.9 (1-7)	1.25±0.5 (1-2)	0.103
Average period of hospitalization (days)	89.4±55.52 (21-200)	43.33±11.55 (30-53)	0.156
Average relapse time	3.27±1.95 (1-7)	1.33±0.58 (1-2)	0.106
Total duration of abstained days	93.75±8.06 (90-110)	50±16.33 (30-100)	0.271

ADHD, attention deficit hyperactivity disorder. *Signifies the level of significance.

that of amphetamine, cocaine, and hallucinogens, only then followed by opioids, which does not appear to be the preferred drug of ADHD sufferers.

It was noticed that 33.3% of the ADHD patients abused alcohol in our study, which is comparable to the study by Downey *et al.* (1997), who investigated 78 adult ADHD patients and determined an incidence of 33.3% for alcohol abuse or dependence.

The age of onset of all substances of abuse was earlier when comorbid with ADHD as compared with non-ADHD abusers. This is comparable to the research by Umut Mert *et al.* (2012) who stated that individuals with ADHD begin using substances at an earlier age with rapid transformation from substance abuse to dependence and substance use becoming more intense. The study also explains our findings that cannabis had the earliest age of onset of about 15 years of age, which could be due to the recent trends of increase in cannabis use by young people in the USA and European countries (European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), 2005).

The duration of drug abuse was longer in SUD patients with ADHD compared with those without ADHD. Among the drugs, cannabis and amphetamine had more chronic usage when compared with opioid and alcohol, which could be probably due to the earlier age at which the drug use starts or due to self-medications for symptoms of inattention and hyperactivity (Biederman *et al.*, 1995; Upadhyaya and Carpenter, 2008).

It is interesting to note that in our study all drugs except alcohol had a greater number of hospitalizations, a longer duration of stay in hospitals, and a greater number of relapses when they coexisted with ADHD. Also, cannabis and amphetamine had a greater number of hospital admissions and longer stays in hospital admissions compared with other drugs. They also have an increase in relapse rate. These findings need further research to find out the probable cause for which this could be hypothesized due to the longer time taken by alcohol to cause considerable damage to the human body as compared with other drugs such as amphetamine, opioid, and cannabis, which lead to gross damage to the body in a short duration of their use. Moreover, patients find it increasingly difficult to come out of their addictive behaviors while using cannabis and amphetamine because of the self-medicating properties. It could also be due the early onset of these substances, which increases the severity of

SUD, decreases the effects of treatment, and prolongs the duration of SUD (Brook *et al.*, 1995; Johnson *et al.*, 2000). Hence, we disproved our hypothesis and there are differences in patients with SUD and ADHD depending on their substance of abuse. Further studies are needed in this area to examine these effects in more detail.

Conclusion

Our study is an indication that the onset, course, and response to treatment of patients with SUD and ADHD vary according to the primary substance of abuse. It points that cannabis and amphetamine contribute to the earlier onset of SUD, prolonged course, and more relapses in these groups of patients, and hence, further research is needed to study the effects of the primary drug of abuse in SUD patients who have comorbid ADHD for better awareness of treatment and prevention of relapses.

Limitations

The findings of this study need to be viewed in light of some of the methodological limitations. Details regarding the primary substance of abuse were obtained in relation to the current primary substance of abuse and this may have an effect on the course, as patients may have used other substances during their lifetime. Because of the small sample size, the study prevents us from making causal inferences on the associations that we found. The diagnosis obtained by a structured interview were based on the retrospective recall of illness such as the age of onset and duration of illness, which are subject to recall bias.

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Conflicts of interest

There are no conflicts of interest.

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