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RESEARCH

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Risk behaviors in substance use disorder in a sample of Egyptian female patients with or without symptoms of attention-deficit hyperactivity disorder

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Abstract

Background Risk-taking behaviors are associated with attention-deficit hyperactivity disorder (ADHD) and substance use disorder (SUD). Individuals with both diagnoses have been reported to have an earlier onset, a longer course, and greater severity, with more relapses and greater difficulty remaining abstinent.

The current study was assessing females seeking treatment for SUDs for the presence of comorbid ADHD, to investigate the association between severity of SUD and co-occurring ADHD symptoms and to examine related risk behaviors. Therefore, thirty female patients were enrolled, and demographic data was collected. Participants were interviewed by SCID I, addiction severity index, Arabic-translated and validated version of the adult ADHD Self-Report Scale Barratt Impulsiveness Scale Version 11, and Arabic version of the Adult Scale of Hostility and Aggression.

Results Thirty female patients were included in the study, and 33.3% had extreme severity, on the addiction severity index scale. Fifteen patients had ADHD symptoms; 33.3% had high likely scores, according to Adult ADHD Self-Reported Scale (ASRS). There is a significant difference regarding the age of onset of substance use and smoking ($P=0.029$), first sexual activity ($P=0.002$), number of sexual partners ($P=0.009$), impairment in employment, and family and social relationships items ($P=0.024$, $P=0.028$, respectively) in SUD patients with ADHD symptoms than in SUD patients without ADHD symptoms.

Conclusion Female patients diagnosed with adult ADHD have an earlier age of smoking and substance use, having first sexual activity at younger age, and having more sexual partners with more employment, family, and social relationship problems.

Keywords Attention-deficit hyperactivity disorder, Substance use disorder, Sexual activity, Risk behaviors, Impulsivity

Background

Attention-deficit hyperactivity disorder (ADHD) is one of the mental disorders that could be present co-morbidly in around 30% of substance use disorder (SUD) patients. It is associated with an earlier onset, a shorter period between the first use of a substance and developing a fulminate SUD, more severe, and chronic course of SUD with poorer prognosis [1–3].

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A link was found between childhood ADHD and early SUD in youth and young adults [4, 5], in which it could persist and affect between 35 and 80% in their adulthood [6–8].

Moreover, it was found that the risk of SUD could be twice as high among people with ADHD and four times as high among those with ADHD and comorbid conduct disorder [9, 10].

In addition, there was a researcher's argument that this is due to genetics, as the genetic pathways responsible for ADHD are the same as those involved with SUD [11]. The dopamine receptor gene (DRD2) is associated in both ADHD hyperactive impulsive type and in SUD [12]. However, this theory need to be balanced with results of a large multisite study indicating that there is completely different neurocircuitry involved in both disorders [13].

On the other side, other researchers found that others reported using substance to in order to attenuate their moods, help them to sleep, and improve their attention and executive functioning [14].

Although ADHD is more common in males than in females, studies indicate that females with ADHD are slightly more likely to have comorbid SUDs than males with ADHD [15].

The true problem is that impulsivity and consequent risk-taking behaviors including unsafe sexual practices [16] and risky driving behaviors [17, 18] are associated with both disorders and still there is not enough data in literature on whether ADHD compounds to the increase in risk-taking behavior or it is related to the SUD. Simply, impulsivity is a core diagnostic feature of the hyperactive-impulsive and combined presentations of ADHD and may be a determining factor in the initiation and maintenance of substance use [19].

Adding on, ADHD is considered an independent predictor of an earlier initiation of sexual activity, more sexual partners, and a higher frequency of casual, unprotected sex [20]; it is associated with high-risk and aggressive driving [21] and a higher rate of motor vehicle accidents [22]. Moreover, it increased the risk of blood-borne virus (BBV) transmission through unsafe drug injection in SUD [23].

Despite the well-documented association between ADHD and SUD, little attention was provided to this association and so this study aimed to ascertain the presence of comorbid ADHD symptoms among females seeking SUD treatment, in addition to investigate the association between severity of substance use disorder and co-occurring ADHD symptoms and to examine related sexual and risk behaviors in females seeking treatment for SUD with co-occurring symptoms of ADHD.

Methods

Study design

An approval was obtained from the ethical committee of the Department of Neuropsychiatry, Ain Shams University and the Addiction Treatment Center, at El Abbasya Mental Health Hospital.

A written informed consent was included in the study explaining in details the study design and aim prior to enrollment. Patients could terminate their participation at any time they desired without justification. Confidentiality of information was assured, and they were informed that this study could be used for scientific publication without the disclosure of the participants' personal identity.

The study was a cross-sectional, hospital-based study, conducted from September 2017 till August 2018. A sample was selected from inpatient addiction treatment department in Abbasia Mental Health Hospital.

Participants

Thirty female patients diagnosed with SUD according to the Structured Clinical Interview for Diagnostic and Statistical manual of mental disorders-IV (SCIDI) were included and divided into two groups, in which 15 patients were diagnosed with SUD only and the other 15 were diagnosed with SUD and co-morbid ADHD. The sample size was calculated using an online calculator, where for a 95% confidence level and a margin of error 5 [24].

Their age ranged from 21 to 40 years old, with more than 15 days of abstinence. Patients who were diagnosed with other psychiatric disorders other than ADHD or SUD, and physical and neurological diseases were excluded from the study.

Sampling method

A convenient sample was selected from the inpatients in the addiction department at Abbasya Mental Health Hospital. Patients fulfilling the inclusion criteria and agreed on participating in the study were included.

Study tools

A semi-structured psychiatric interview designed by El Abbasya Mental Health Hospital which included sociodemographic data of the participants (age, sex, educational level, marital status, and occupation), history of present illness, past medical, psychiatric history, and sexual history and family history as well. A full medical history and examination (general, cardiological, chest, and neurological examination) were performed to detect any neurological or chronic medical condition to be excluded

from the study. Urine toxicology screen for alcohol, methamphetamine, tramadol, tetrahydrocannabinoides, opioids, benzodiazepines, and cocaine were done.

All subjects of the study were assessed using the following tools:

- SCID I: diagnostic tool [25]. It is considered the standard interview to verify diagnosis in clinical trials and is extensively used in other forms of psychiatric research. The Arabic Version was used [26].
- Addiction severity index (ASI) [27]. It is a semi-structured interview designed to address seven potential problem areas in substance-abusing patients: medical status, employment and support, drug use, alcohol use, legal status, family/social status, and psychiatric status. The Arabic version was used [28].
- Arabic-translated and validated version of the adult ADHD Self-Report Scale (ASRS-v1.1) Symptom Checklist [29]. It is used to screen for adult ADHD symptoms. The Arabic version [30] was used as participants were asked to reflect upon their usual behavior rather than a behavior attributed to their drug use.
- Barratt Impulsiveness Scale Version 11 (BIS) [31]. It include questions to assess risk-taking behaviors. It is is a gold-standard measure that has been influential in shaping current theories of impulse control and has played a key role in studies of impulsivity and its biological, psychological, and behavioral correlates. Arabic version test was applied [32].
- Arabic version of the Adult Scale of Hostility and Aggression [33]. It is an instrument for measuring aggressive and hostile behavior in adults. The scale consists of four subscales including: verbal aggression, physical aggression, hostile affect, and anger. The Arabic version was applied [34].

Data management and analysis

Data were revised, coded, and entered on a computer and analyzed using SPSS package version number 20. Quantitative data were described as mean, standard deviation (±SD), and range for parametric numerical data, while median and interquartile range (IQR) for non-parametric numerical data. Student *T* test was used to assess the statistical significance of the difference between two study group means. Mann–Whitney test (*U* test) was used to assess the statistical significance of the difference of a non-parametric variable between two study groups. Fisher's exact test was used to examine the relationship between two qualitative variables when the expected count is less than 5 in more than 20% of cells. Qualitative data were expressed as frequencies (*n*) and percentage (%).

Results

Descriptive data

Socio-demographic characteristics

Thirty female patients were included. The age of the patients ranged from 21 to 40 years old with a mean of 23.6 ± 2.6 years. Fifteen of them were single (50%), 11 were married (36.7%), and 4 were divorced (13.3%).

The clinical characteristics of the study sample

Family history

Seventeen patients had no family history of psychiatric illness while 5 patients (16.7%) had family history of SUD and another 5 patients (16.7%) with mood disorder while 3 patients (10%) had family history of ADHD.

Type of substance use

Twenty five patients (83.3%) were abusing tetrahydrocannabinoids while 5 patients (16.7%) were abusing synthetic cannabinoids. On the other hand, 24 patients (80%) were abusing alcohol. Opiates was abused by 15 patients (50%). yet, 9 patients (30%) were abusing tramadol, and 7 patients (23.3%) were abusing pregabline, with total of 28 patients that were polysubstance abusers.

Age of onset of substance use and smoking

The mean age of onset of substance use was 15.5 ± 2.6, and the mean age of onset of smoking was 13.5 ± 3.

Psychometric assessments

Addiction severity index

On the other side, the patients were interviewed with addiction severity index scale, 10 patients (33.3%) had extreme severity, 12 patients (40%) had considerable severity, 6 patients (20%) had mild severity, and 2 patients (6.7%) had slight severity and not problematic enough to affect their life socially or financially.

According to the addiction severity index items, considerable health/medical problems were reported in 10 patients (33%); considerable employment problems affecting their work, financial situation, and support status were affected in 16 patients (53.3%). Moving to drug and alcohol abuse and relapse item, 12 patients (40%) had considerable problems related to daily doses of substance use, hospital admission, and trials of abstinence and relapses. Considerable legal problems were detected in 10 patients (33%), while 12 patients (40%) had mild problems as they got involved in illegal activities for profit (sex trading; activities that involve providing sexual services for money, selling stolen gods, stealing). Furthermore, considerable problems in family and social relationships

were found in 12 patients (40%), while 10 patients (33%) had severe problems.

Adult ADHD self-reported scale

Through the study, 15 patients had ADHD symptoms; 33.3% had high likely scores on ADHD symptoms according to adult ADHD Self-Reported Scale (ASRS) and 16.7% had likely scores on the same scale.

Assessment of risk behavior

Full sexual history from the patient by semi-structured psychiatric interview designed by El Abbasya Mental Health Hospital The mean age of first sexual activity was 16.8 ± 2.1 years, and the number of sexual partners till the time of the study is 3 ± 2–5 partners. Sexual activity was defined by any activity—solitary, between two persons, or in a group—that induces sexual arousal [35].

Barratt Impulsiveness Scale and the Adult Scale of Hostility and Aggression On Barratt Impulsiveness Scale and the Adult Scale of Hostility and Aggression, 22 patients (73.3%) were severely impulsive and 8 patients (26.7%) were moderately impulsive, while when interviewing with the Adult Scale of Hostility and Aggression, it was found that 43.3% physical aggression and 63.3% had verbal aggression. Forty percent had moderate degrees of anger, and 56.7% had severe anger. On the other hand, 46.6% showed mild hostility.

Comparisons between SUD patients with the ADHD symptom group and SUD patients without the ADHD symptom group

Sociodemographic data and clinical variables (family history, type of substance of abuse, and age of onset for substance and smoking)

Through the study, a non-statistical significance was found on comparing socio-demographic data, family history, and type of substance abuse except for synthetic cannabinoids in SUD patients with the ADHD symptom group as statistically it approached significance ($P = 0.042$) (Table 1).

There was a significant difference regarding the age of onset of substance use and smoking as SUD patients with the ADHD symptom group started their substance use earlier than SUD patients without the ADHD symptom group with the mean age of 14.5 and 16.5, respectively, and start smoking (nicotine use) at the mean age of 12 years (earlier by 2 years than SUD patients without the ADHD symptom group) ($P = 0.029$) (Table 2).

Addiction severity index components and total score

Statistical significance was found in SUD patients with the ADHD symptom group as they had more severe impairment in employment, and family and social relationships items than SUD patients without the ADHD symptom group as measured by addiction severity index ($P = 0.024$, $P = 0.028$, respectively) (Table 3).

Table 1 Comparison between SUD patients with ADHD symptoms group and SUD patients without ADHD symptoms group

	SUD patients with the ADHD symptom group		SUD patients without the ADHD symptom group		Fisher's exact test	
	N	%	*N*	%	*p* value	Sig
Alcohol	13	86.7%	11	73.3%	0.651	NS
Opiates	7	46.7%	8	53.3%	1.000	NS
THC	12	80.0%	13	86.7%	1.000	NS
Pregabalin	5	33.3%	2	13.3%	0.390	NS
Tramadol	6	40.0%	3	20.0%	0.427	NS
Synthetic Cannabinoids	5	33.3%	0	0.0%	0.042	S

THC Tetrahydrocannabinoids

Table 2 Comparison between SUD patients with the ADHD symptom group and SUD patients without the ADHD symptom group as regards age of onset for substance use and smoking

	SUD patients with the ADHD symptom group		SUD patients without the ADHD symptom group		*T* test	
	Mean	± SD	Mean	± SD	*p* value	Sig
Age of onset of substance use	14.5	± 1.9	16.5	± 1.9	0.029	S
Age of onset of smoking	12	± 1.9	14	± 1.9	0.029	S

Table 3 Comparison between SUD patients with the ADHD symptom group and SUD patients without the ADHD symptom group as regards addiction severity index components

		SUD patients with the ADHD symptom group		SUD patients without the ADHD symptom group		Monte Carlo test	
		Mean *N*	SD %	Mean *N*	SD %	*p* value	Sig
Health	No	3	20%	2	13.3%	0.436	NS
	Slight	7	46.6%	5	33.3%		
	Mild	0	0.0%	3	20%		
	Considerable	5	33.3%	5	33.3%		
	Severe	0	0.0%	0	0.0%		
Employment	No	0	0.0%	1	6.7%	0.024	S
	Slight	0	0.0%	2	13.3%		
	Mild	1	6.7%	0	0.0%		
	Considerable	6	40.0%	10	66.7%		
	Severe	8	53.3%	2	13.3%		
Drug and alcohol	No	0	0.0%	0	0.0%	0.135	NS
	Slight	0	0.0%	1	6.7%		
	Mild	2	13.3%	5	33.3%		
	Considerable	5	33.3%	7	46.7%		
	Severe	8	53.3%	2	13.3%		
Legal	No	1	6.7%	1	6.7%	0.586	NS
	Slight	1	6.7%	3	20.0%		
	Mild	5	33.3%	7	46.7%		
	Considerable	6	40.0%	4	26.7%		
	Severe	2	13.3%	0	0.0%		
Family and social	No	0	0.0%	0	0.0%	0.028	S
	Slight	0	0.0%	2	13.3%		
	Mild	4	26.7%	2	13.3%		
	Considerable	3	20.0%	9	60.0%		
	Severe	8	53.3%	2	13.3%		

While non-statistical significance between both groups as regards health/medical status, legal status, alcohol, and drug components of addiction severity index. Although non-statistical significance was found in addiction severity index, SUD with the ADHD symptom patient group were higher in extreme severity with 53.3% in contrast to 13.3% for SUD patients without the ADHD symptom group.

Assessment of risk behaviors including sexual risk behavior, Barrett impulsiveness scale and the adult scale of aggression and hostility scale

There is a statistical significant difference regarding the age of onset of first sexual activity ($P=0.002$), number of sexual partners ($P=0.009$) as SUD patients with the ADHD symptom group started their sexual activity at an earlier age than SUD patients without ADHD symptoms group with mean age of 15.7 and 17.9, respectively, and had more sexual partners than SUD patients without the ADHD symptom group who has a mean number of partners of 5 and 3, respectively (Table 4).

Regression analysis of sexual risk behavior was done and showed that co-occuring of ADHD with SUD was predictive of having first sexual activity at younger age and having more sexual partners.

There was no statistically significance between SUD patients with the ADHD symptom group and SUD patients without the ADHD symptom group regarding impulsivity, type of aggression, and hostility.

Discussion

The relation between ADHD and substance use disorder was previously studied. Impulsivity and consequent risk-taking are features of both ADHD and SUD [36].

In this study, the mean age was 23.6 years, as early adulthood is the most common age group to seek treatment in hospital. Fifty percent of patients were single with no statistical significance between SUD patients with the ADHD symptom group and without the

Table 4 Comparison between SUD patients with the ADHD symptom group and SUD patients without the ADHD symptom group regarding sexual risk behaviors

	SUD patients with the ADHD symptom group		SUD patients without the ADHD symptom group		Test of sig	Sig
	Mean Median	SD IQR	Mean Median	SD IQR		
Age of first sexual activity	15.7	1.9	17.9	1.8	0.002 (T)	S
Number of sexual partners	5	3–6	3	2–3	0.009 (M)	S

T *t* test,

M Mann–Whitney test

ADHD symptom group. However, Arabgol et al. and Ohlmeier et al. found higher rates of divorce and separation among patients diagnosed with ADHD and SUD [37, 38].

Parellel to Molina et al. and Wilens et al., nicotine dependence was found earlier in patients with ADHD symptoms (12 years old) than in patients with SUD only (14 years old) which could be suggestive that considering smoking in early age with ADHD symptoms a higher risk for development of SUDs as biologically, nicotine exposure may make the brain more susceptible to later behavioral problems and SUDs [39, 40].

In concordance with Chilcoat et al., Kim et al., Abdelkareem et al., and González et al., statistical significance was found as regards the mean age of onset for substance in patients with ADHD symptoms 14.5 ± 1.9 years while in patients without ADHD symptoms was 16.5 ± 1.9 years. This can be explained by the fact that some substances are used as self-medication at first in ADHD patients [41–44].

Among the study sample, the most abused substances were cannabis, alcohol, and opiates (83%, 80%, 50%), although all SUD patients with ADHD symptoms were abusing more than one substance as cannabis and opiates were the most commonly reported drugs of abuse among Egyptians since the early 1990s [45]. Hamdi et al. concluded that Cannabis was the drug mostly misused in Egypt and alcohol the second [46].

The use of synthetic cannabinoids (SC) was statistically significant among SUD patients with ADHD symptoms ($P = 0.042$) as it become increasingly popular in the last few years, especially among adolescents. Moreover, Zehra et al. found that ADHD is overrepresented in patients with substance use across adolescents using synthetic cannabinoids [47] and Köck et al. mentioned that ADHD patients have higher use of nicotine, alcohol, and illicit drug [48].

Regarding the addiction severity index (ASI) scale results, there were no statistically significant differences in the total score between both groups, although more than 50% of SUD patients with ADHD symptoms scored extreme on total ASI.

However, there was statistical significance on comparing both groups as regards employment/financial support and family/social relations which could affect the opportunities of recovery and social reintegration, coping abilities, and frustration tolerance. In line with this, Faraone et al. reported that having ADHD symptoms among heroin-dependent patients was significantly associated with unemployment status [49].

On the other hand, statistical significance was found among SUD patients with the ADHD symptom group who initiated sexual acts at earlier age of 15.7 years ($P = 0.002$) and more partners with a median of 5 partners ($P = 0.009$).

The number of sexual partners and the age of onset of the first sexual activity were predictive of having ADHD symptoms which was in alliance with Abrantes et al. [20]. Monawar et al. reported ADHD as a predictor of an earlier initiation of sexual activity, more sexual partners, and a higher frequency of casual, unprotected sex [50].

In the current study, scoring on Barrett impulsivity scale (BIS) showed that more than 70% scored severe yet with no statistical significance between both groups. Higher percentage in patients with ADHD symptoms (87%) was severe, and 60% in the SUD patients without the ADHD symptom group was severe. This may be as ADHD could be an adding factor for impulsivity, and females with ADHD are more inattentive than hyperactive. Similar to Ortal et al. agreed that high impulsivity in children with ADHD plays a key role in their vulnerability to SUD, and it was concluded that different impulsivity constructs operate independently and interact with each other to affect adult risk taking behavior and SUD in patients with childhood ADHD [51].

In contrast to Cleo et al. and Filiz et al. in another study using BIS, total BIS scores were statistically and significantly correlated with total ASRS and patients had higher rates of comorbid ADHD and impulsivity scores than healthy controls [52, 53].

Regarding hostility and aggression scale, more than 95% of the study group ranged between no hostile actions to mild, also 100% were verbally aggressive and more than 83% were physically aggressive, and 100% of the study group had anger issues yet with no statistical significance between both groups. Barkley et al. agreed that patients with both diagnoses of SUD and ADHD had symptoms such as irritability, impatience, anger, low frustration threshold, and reactive aggression which greatly increase the risk for coercive, oppositional interchanges [54]. Together with Bácskai et al. illustrated that patients who screened positive for ADHD had significantly higher severity of overall trait aggression, physical, and verbal aggression [55].

Although ADHD compromises SUD treatment retention and outcomes, SUD treatment services do not typically screen for adult ADHD [56]. As ADHD is also likely to elevate risk-taking and consequent harm among those with SUD, routine screening for ADHD at treatment intake, further assessment if ADHD is indicated and interventions to manage risk-taking are strongly recommended [36].

Limitations

The small sample size of the study and not randomized sampling in which the results could not be generalized are the limitations of the study. Moreover, the whole sample did not use the same substance; thus, the difference in substance abused could contribute to the results. On the other hand, stigma for the substance use disorder among females made it hard for many females to participate in the study.

Conclusions

The presence of adult ADHD symptoms significantly affects the course of substance use disorder in females and increases risk-taking behavior. Female patients diagnosed with adult ADHD have an earlier age of smoking and onset of substance use compared to those without ADHD, showing more employment, family, and social relationship problems as assessed.

Having adult ADHD with SUD in females was considered a predictor of having a first sexual activity at younger age and having more sexual partners compared to those without ADHD.

Abbreviations

ADHD	Attention-deficit/hyperactivity disorder
SUD	Substance use disorder
BIS	Barratt Impulsiveness Scale
DRD2	Dopamine receptor gene
BBV	Blood-borne virus
SCIDI	Structured Clinical Interview for Diagnostic and statistical manual of mental disorders
ASI	Addiction severity index
ASRS-v1.1	Arabic-translated and validated version of the adult ADHD Self-Report Scale
SC	Synthetic cannabinoids

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Authors' contributions

AE, MA, and HE: analysis and interpretation of the data design, concept of the study, and critical revision of the manuscript. FT: interpretation of the data, and drafting and revision of the manuscript. RF: data collection, statistical analysis, analysis and interpretation of the data, and drafting of the manuscript. The authors read and approved the final version of the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

An approval was obtained from the ethical committee of the Department of Neuropsychiatry, Ain Shams University, and the Addiction Treatment Center at El Abbasya Mental Health Hospital. Written consent was obtained from all participants.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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References

1. Kaye S, Darke S, Torok M (2013) Attention deficit hyperactivity disorder (ADHD) among illicit psychostimulant users: a hidden disorder? Addiction 108:923–931
2. Wilens TE, Martelon M, Joshi G, Bateman C, Fried R, Petty C, Biederman J (2011) Does ADHD predict substance-use disorders? A 10-year follow-up study of young adults with ADHD. J Am Acad Child Adolesc Psychiatry. 50:543–553
3. McAweeney M, Rogers NL, Huddleston C, Moore D, Gentile JP (2010) Symptom prevalence of ADHD in a community residential substance abuse treatment program. J Atten Disord 13:601–608
4. Zhang-James Y, Chen Q, Kuja-Halkola R, Lichtenstein P, Larsson H, Faraone SV (2020) Machine-learning prediction of comorbid substance use disorders in ADHD youth using Swedish registry data. J Child Psychol Psychiatry Allied Discip 61:1370–1379. https://doi.org/10.1111/jcpp.13226
5. Özgen H, Spijkerman R, Noack M, Holtmann M, Schellekens A, Dalsgaard S et al (2021) Treatment of adolescents with concurrent substance use disorder and attention-deficit/hyperactivity disorder: a systematic review. J Clin Med 10:3908. https://doi.org/10.3390/jcm10173908
6. Chamakalayil S, Strasser J, Vogel M, Brand S, Walter M, Dürsteler K (2021) Methylphenidate for attention-deficit and hyperactivity disorder in adult patients with substance use disorders: good clinical practice. Front Psychiatr 11:540837
7. Barkley RA, Murphy KR, Fischer M (1997) advancing age, declining ADHD. Am J Psychiatry 154:1323–1325

8. Kessler RC, Adler L, Barkley R et al (2006) The prevalence and correlates of adult ADHD in the United States: results from the National Comorbidity Survey Replication. Am J Psychiatry 163:716–723
9. Wilens TE et al (2011) Does ADHD predict substance-use disorders? A 10-year follow-up study of young adults with ADHD. J Am Acad Child Adolesc Psychiatry 50(6):543–53 [PMC free article] [PubMed] [Google Scholar]
10 Ercan ES et al (2003) Childhood attention deficit/hyperactivity disorder and alcohol dependence: a 1-year follow-up. Alcohol Alcohol 38(4):352–6 [PubMed] [Google Scholar]
11. Skoglund C, Chen Q, Franck J, Lichtenstein P, Larsson H (2015) Attention-deficit/hyperactivity disorder, and risk for substance use disorders in relatives. Biol Psychiatry 77:880–886. https://doi.org/10.1016/j.biopsych.2014.10.006
12. Jones JD, Comer SD, Kranzler HR (2015) The pharmacogenetics of alcohol use disorder. Alcohol Clin Exp Res 39:391–402. https://doi.org/10.1111/acer.12643
13. Whelan R et al (2012) Adolescent impulsivity phenotypes characterized by distinct brain networks. Nat Neurosci. https://doi.org/10.1038/nn.3092. [PubMed][CrossRef][GoogleScholar]
14 Wilens TE, Decker MW (2007) Neuronal nicotinic receptor agonists for the treatment of attention-deficit/hyperactivity disorder: focus on cognition. Biochem Pharmacol 74(8):1212–23 [PMC free article] [PubMed] [Google Scholar]
15. Ottosen C, Larsen JT, Faraone SV, Chen Q, Hartman C, Larsson H et al (2019) Sex differences in comorbidity patterns of attention-deficit/hyperactivity disorder. J Am Acad Child Adolesc Psychiatry 58:412–22.e3. https://doi.org/10.1016/j.jaac.2018.07.910
16. Feldstein SW, Miller WR (2006) Substance use and risk-taking among adolescents. J Ment Health 15:633–643
17. Banks S, Catcheside P, Lack L, Grunstein RR, McEvoy RD (2004) Low levels of alcohol impair driving simulator performance and reduce perception of crash risk in partially sleep deprived subjects. Sleep 27:1063–1067
18. Kelly E, Darke S, Ross J (2004) A review of drug use and driving: epidemiology, impairment, risk factors and risk perceptions. Drug Alcohol Rev 23:319–344
19. Dick DM, Smith G, Olausson P, Mitchell SH, Leeman RF, O'Malley SS, Sher K (2010) REVIEW: understanding the construct of impulsivity and its relationship to alcohol use disorders. Addict Biol 15:217–226
20. Abrantes AM, Strong DR, Ramsey SE, Kazura AN, Brown RA (2006) HIV-risk behaviors among psychiatrically hospitalized adolescents with and without comorbid SUD. J Dual Diagn 2:85–100
21. Cox D, Madaan V, Cox B (2011) Adult attention-deficit/hyperactivity disorder and driving: why and how to manage it. Curr Psychiatry Rep 13:345–350
22. Jerome L, Segal A, Habinski L (2006) What we know about ADHD and driving risk: a literature review, meta-analysis and critique. J Can Acad Child Adolesc Psychiatry 15:105–125
23. Degenhardt L, Hall W (2012) Extent of illicit drug use and dependence, and their contribution to the global burden of disease. Lancet 379:55–70
24. Home (no date) Calculator.net. Available at: https://www.calculator.net/sample-size-calculator.html (Accessed: 19 Jan 2023).
25. First MB, Gibbon M (2004) The structured clinical interview for DSM-IV axis I disorders (SCID-I) and the structured clinical interview for DSM-IV axis II disorders (SCID-II)
26. El Missiry A, Sorour A, Sadek A (2004) Homicide and psychiatric illness. An Egyptian study: MD Thesis in Ain Shams University. Ain Shams University, Cairo
27. McLellan AT, Luborsky L, O'Brien CP, Woody GE (1980) An improved diagnostic instrument for substance abuse patients: the Addiction Severity Index. J NervMent Dis 168:26–33
28. Qasem T, Beshry Z, Asaad T et al (2003) Profiles of neuropsychological dysfunction in chronic heroine users. M.D. degree thesis. Faculty of Medicine, Ain Shams University.
29. Kessler RC, Adler L, Ames M (2005) The World Health Organization adult ADHD self-report scale (ASRS): a short screening scale for use in the general population. Psychol Med 35(2):245–256
30. Nashaat M, Emad M, Moussa S, Abdel Sameea M (2013). The Arabic version of World Health Organization Adult ADHD Self-Report Scale (ASRS) for use in the general population. Available at: http://www.hcp.med.harvard.edu/ncs/asrs.php.
31. Patton JH, Stanford MS, Barratt ES (1995) Factor structure of the Barratt Impulsiveness scale. J Clin Psychol 51:768–74
32. El Rafie H, Ghanem M, Gamal H (2009): Psychiatric assessment of cases with self-inflicted poisoning in a sample of Egyptian children and adolescents. MD thesis, Institute of Psychiatry, Ain Shams University, Cairo.
33. Zillmann D (1979) Hostility and aggression. Hillsdale: Lawrence Erlbaum Assossociates
34. Abazza A (2003) Aggression and its relation with personality dimensions in psychosomatic patients MD thesis, Tanta University.
35. Gebhard, P. H. (n.d.). Human sexual activity. Encyclop瓑dia Britannica. Retrieved January 19, 2023, from https://www.britannica.com/topic/human-sexual-activity.
36. Kaye S, Gilsenan J, Young JT, Carruthers S, Allsop S, Degenhardt L, van de Glind G, van den Brink W (2014) Risk behaviours among substance use disorder treatment seekers with and without adult ADHD symptoms. Drug Alcohol Depend 144:70–77
37. Arabgol FHM, Hadid M (2004) Prevalence of adult attention deficit/hyperactivity symptoms in group of students. New Cogn Sci 6(1, 2):73–7
38. Ohlmeier MD, Peters K, Kordon A (2007) Nicotine and alcohol dependence in patients with comorbid attention-deficit/hyperactivity disorder (ADHD). Alcohol Alcohol 42(6):539–543
39. Molina SG, Pelham W (2003) Childhood predictors of adolescent substance use in a longitudinal study of children with ADHD. J Abnormal Psychology 112(3):497–507
40. Wilens TE, Martelon M, Joshi G (2011) Does ADHD predict substance-use disorders? A 10-year follow-up study of young adults with ADHD. J Am Acad Child Adolesc Psychiatry 50(6):543–553
41. Chilcoat HD, Breslau N (1999) Pathways from ADHD to early drug use. J Am Acad Child Adolesc Psychiatry 38:1347–1354
42. Kim JW, Park CS, Hwang JW, Shin MS, Hong KE, Cho SC, Kim BN (2006) Clinical and genetic characteristics of Korean male alcoholics with and without attention deficit hyperactivity disorder. Alcohol Alcohol 41(4):407–411
43. Abdelkarim A, Salama H, Ibrahim S, El Magd OA (2015) The prevalence and characteristics of attention-deficit hyperactivity disorder among a sample of Egyptian substance-dependent inpatients. Egypt J Psychiatr 36:9–13
44. González R, Vélez-Pastrana M, Blankers M, Bäcker A, Konstenius M, Holtmann M, Levin F, Noack M, Kaye S, Demetrovics Z, van de Glind G, van den Brink W, Schellekens A (2020) Onset and severity of early disruptive behavioral disorders in treatment-seeking substance use disorder patients with and without attention-deficit/hyperactivity disorder. Eur Addict Res 26(Suppl. 4–5):211–222
45. Soueif M, Hannourah M, Darweesh ZA (1990) The use of psychoactive substances by males working in the manufacturing industry. Drug Alcohol Depend 26:63–79
46. Hamdi E, Gawad T, Khoweiled A, Sidrak AE, Amer D, Mamdouh R, Fathi H, Loza N (2013) Lifetime prevalence of alcohol and substance use in Egypt: a community survey. Substance Abuse 34(2):97–104
47. Zehra Çelik ZÇ, Çolak Ç, Di Biase MA, Zalesky A, Zorlu N, Bora E, Kitiş Ö, Yüncü Z (2019) Structural connectivity in adolescent synthetic cannabinoid users with and without ADHD. Brain Imaging Behav, 1–0.
48. Köck P, Meyer M, Elsner J, Dürsteler K, Vogel M, Walter M (2022) Co-occurring mental disorders in transitional aged youth with substance use disorders – a narrative review. Front Psychiatry, 13.https://doi.org/10.3389/fpsyt.2022.827658
49. Faraone SV, Biederman J (2005) What is the prevalence of adult ADHD? Results of a population screen of 966 adults. J Atten Disord 9(2):384–391
50. Monawar Hosain G.M., Abbey B. Berenson, Howard Tennen, Lance O. Bauer, Z. Helen Wu (2012) Womens Health (Larchmt); 21(4): 463–468. https://doi.org/10.1089/jwh.2011.2825
51. Ortal S, Johan F, Itai B, Nir Y, Iliyan I (2015) The role of different aspects of impulsivity as independent risk factors for substance use disorders in patients with ADHD: a review. Curr Drug Abuse Rev 8(2):119–133
52. Crunelle Cleo, Veltman DJ, van Emmerik-van Oortmerssen K, Booij J, van den Brink W (2013) Impulsivity in adult ADHD patients with and without cocaine dependence. Drug Alcohol Depend 129(1–2):18–24
53. Kulacaoglu F, Solmaz M, Belli H, Ardic FC, Akin E, Kose S (2017) The relationship between impulsivity and attention-deficit/hyperactivity

symptoms in female patients with borderline personality disorder. Psychiatry and Clinical Psychopharmacology 27(3):249–255
54. Barkley RA, Fischer M (2010) The unique contribution of emotional impulsiveness to impairment in major life activities in hyperactive children as adults. J Am Acad Child Adolesc Psychiatry 49:503–513. https://doi.org/10.1016/j.jaac.2010.01.019
55. Bácskai E, Czobor P, Gerevich J (2012) Trait aggression, depression and suicidal behavior in drug dependent patients with and without ADHD symptoms. Psychiatry Res 200(2–3):719–723
56. McAweeney M, Rogers NL, Huddleston C, Moore D, Gentile JP (2010) Symptom prevalence of ADHD in a community residential substance abuse treatment program. J Atten Disord 13:601–608

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