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Research Article

Exploring Emotional Regulation, Depression, Impulsivity, and Anxiety Connected to Attention Deficit Hyperactivity Disorder with Substance Use

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Abstract

Background: Emotional regulation difficulties, depression, impulsivity, and anxiety are psychological factors that frequently co-occur with substance use in attention deficit hyperactivity disorder. These factors contribute to maladaptive coping strategies, increasing vulnerability to substance use patterns. **Objective:** To explore the psychological factors of the co-occurrence of ADHD with substance use, with a specific focus on emotional regulation, depression, impulsiveness, and anxiety. **Methods:** This cross-sectional study, conducted from September 2023 to September 2024 at a university in Eastern Odisha, explored psychological factors among undergraduate students aged 18–26 with ADHD and co-occurring substance use. Data collection utilizes validated tools, including ASRS-V1.1, ASSIST, HAM-D, HAM-A, DERS, and BIS. **Results:** The study analyzed 1,310 undergraduate students, showing 8.2% with ADHD, of which 52.3% reported substance use (SU). Impulsivity was significantly associated with SU, with higher impulsivity reported in SU individuals. Anxiety also showed a strong association with SU. However, emotional dysregulation and depression were not significantly linked to SU. These findings highlight key psychological factors influencing substance use in ADHD. **Conclusions:** This study underscores the significant role of impulsiveness and anxiety in the co-occurrence of substance use (SU) among individuals with ADHD, while emotional dysregulation and depression were not found to have a significant association. These findings highlight the need for targeted interventions addressing impulsiveness and anxiety to mitigate the risk of SU in this population.

Keywords: Anxiety, Emotional dysregulation, Depression, Impulsivity.

استكشاف التنظيم العاطفي والاكتئاب والانفعال والقلق المرتبط باضطراب فرط الحركة ونقص الانتباه مع تعاطي المخدرات

الخلاصة

الخلفية: صعوبات التنظيم العاطفي والاكتئاب والانفعال والقلق هي عوامل نفسية تتزامن بشكل متكرر مع تعاطي المخدرات في اضطراب نقص الانتباه وفرط النشاط. تساهم هذه العوامل في استراتيجيات التكيف غير الفعالة على التكيف، مما يزيد من التعرض لأنماط تعاطي المخدرات. **الهدف:** استكشاف العوامل النفسية لتزامن اضطراب فرط الحركة ونقص الانتباه مع تعاطي المخدرات، مع التركيز بشكل خاص على التنظيم العاطفي والاكتئاب والانفعال والقلق. **الطرائق:** استكشفت هذه الدراسة المقطعية، التي أجريت في الفترة من سبتمبر 2023 إلى سبتمبر 2024 في جامعة في شرق أوديشا، العوامل النفسية بين الطلاب الجامعيين الذين تتراوح أعمارهم بين 18 و 26 عاما والمصابين باضطراب فرط الحركة ونقص الانتباه وتعاطي المخدرات المتزامنة. يستخدم جمع البيانات أدوات تم التحقق من صحتها، بما في ذلك ASRS-V1.1 و ASSIST و HAM-D و HAM-A و DERS و BIS. **النتائج:** حللت الدراسة 1,310 طالبا جامعيًا، وأظهرت 8.2% مصابين باضطراب فرط الحركة ونقص الانتباه، وأبلغ 52.3% منهم عن تعاطي المخدرات (SU). ارتبط الانفعال بشكل كبير ب SU، مع الإبلاغ عن انفعال أعلى لدى أفراد SU. أظهر القلق أيضًا ارتباطًا قويًا ب SU. ومع ذلك، لم يكن عدم التنظيم العاطفي والاكتئاب مرتبطين بشكل كبير ب SU. تسلط هذه النتائج الضوء على العوامل النفسية الرئيسية التي تؤثر على تعاطي المخدرات في اضطراب فرط الحركة ونقص الانتباه. **الاستنتاجات:** تؤكد هذه الدراسة على الدور الهام للانفعال والقلق في تزامن تعاطي المخدرات (SU) بين الأفراد المصابين باضطراب فرط الحركة ونقص الانتباه، بينما لم يتم العثور على خلل في التنظيم العاطفي والاكتئاب لهما ارتباط كبير. تسلط هذه النتائج الضوء على الحاجة إلى تدخلات مستهدفة تعالج الانفعال والقلق للتخفيف من مخاطر الإصابة بالانفعال والقلق لدى هذه الفئة من السكان.

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INTRODUCTION

Adult attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental condition characterized by persistent patterns of inattention, hyperactivity, and impulsivity that can interfere with daily functioning and development [1]. Affecting both children and adults, ADHD is increasingly recognized as a lifelong condition that, if untreated, can contribute to a range of psychological and social challenges [2]. Substance

use (SU), a condition characterized by compulsive use of substances despite negative effects, is one particularly worrying comorbidity associated with ADHD [3]. Substance use, defined as the excessive and harmful consumption of substances such as alcohol, drugs, or prescription medications, is linked to neurobiological and psychological factors that often overlap with ADHD [4]. The comorbidity of ADHD and SUD is notably high, with studies indicating that individuals with ADHD are at a substantially

increased risk of developing substance use compared to the general population [3]. This dual diagnosis is associated with a range of adverse outcomes, including heightened emotional dysregulation, exacerbated impulsivity, and increased vulnerability to depression and anxiety. The co-occurrence of ADHD and substance use presents a complex interplay of neurobiological, behavioral, and environmental factors. Previous research indicates that in Northeast India, individuals with ADHD are at a significantly higher risk of developing substance use compared to the general population, with estimates suggesting that 24.3% of adults in addiction treatment settings meet the criteria for ADHD [5]. This overlap is attributed to shared pathways of impulsiveness, self-regulation deficits, and a propensity for risk-taking behaviors. Additionally, individuals with ADHD may engage in substance use as a form of self-medication to manage symptoms of inattention or emotional dysregulation. The interplay between ADHD and SUD presents a unique and underexplored psychological profile [6]. Emotional regulation deficits, a hallmark of ADHD, may be magnified in the presence of substance use disorder, leading to more severe symptoms of depression and anxiety. Similarly, impulsivity, a core feature of ADHD, may contribute to the initiation and perpetuation of substance use, creating a feedback loop that exacerbates both disorders. Understanding these interactions is crucial for developing targeted interventions and treatment plans [4,7]. A review of research found that the psychological impact of these comorbid conditions extends beyond the individual, influencing familial relationships, occupational performance, and quality of life. ADHD with substance use is also associated with increased rates of mood disorders, anxiety disorders, and personality disorders, creating a multifaceted burden on mental health systems [8]. The presence of ADHD in individuals with substance use compounds the challenges of diagnosis and treatment. For example, overlapping symptoms, such as impulsivity and difficulty maintaining focus, may blur the boundaries between the two disorders, leading to misdiagnosis or underdiagnosis. Moreover, the co-occurrence of ADHD and substance use often exacerbates psychological distress, reduces treatment adherence, and worsens overall outcomes, including higher relapse rates [4]. Impulsivity is a characteristic that can make people more likely to develop drug use disorders since it is typified by behaviors made without prior planning. Both biological and psychological causes cause impulsivity, but societal norms and values are also important. India's cultural norms on self-control, family responsibilities, and public image might affect how impulsive behavior manifests itself. For instance, impulsive actions that lead to substance abuse may cause severe social shame in collectivist cultures like India, where family and community are valued, which may influence behaviors related to getting assistance [9]. In India, cultural views have a significant role in how society responds to drug usage. Because substance use is

frequently seen through a moralistic prism, people with substance use disorders are stigmatized and subjected to prejudice. Inaccessibility to support networks and therapy may result from this stigma [9]. It is important to comprehend cultural subtleties to create successful preventative and intervention plans that are acceptable and sensitive to cultural differences [10]. As students adjust to college, they frequently encounter new social groups where peer pressure can greatly influence behavior. Students may experiment with drugs to gain social acceptance. A narrative review found that among Indian college students, drug use is linked to stress, peer pressure, curiosity, and social festivities [11].

Purpose and Rationale

The purpose of this study was to examine the psychological factors underlying the co-occurrence of ADHD and substance use (SU), with a particular focus on emotional regulation, depression, impulsivity, and anxiety. Understanding these factors is critical, as individuals with ADHD are disproportionately at risk of engaging in SU, which may worsen their clinical and functional impairments. The rationale for the study is grounded in the increasing prevalence of ADHD and SU among young adults, particularly in university settings, where developmental challenges and environmental stressors may amplify psychological vulnerabilities. Impulsivity and anxiety have been previously suggested as potential mediators of SU behaviors, while emotional dysregulation and depression are often hypothesized to contribute to the psychopathological burden. By employing validated tools and rigorous statistical analysis, this study aims to disentangle the role of these factors, providing insights for targeted interventions.

METHODS

Study design and setting

A preliminary cross-sectional study was conducted at a single university located in Eastern Odisha. The research was conducted over a 13-month period, from September 2023 to September 2024, to gather data on undergraduate students. Participants were selected using a stratified random sampling method. The student population was divided into distinct strata based on academic year and field of study criteria. Random sampling was performed within each stratum to ensure representation across all segments. The study utilized scales to assess ADHD students' levels of anxiety, depression, impulsivity, and emotional dysregulation.

Inclusion criteria

Students are between 18 and 26 years. Currently, undergraduate students at the university are enrolled as students who provide written informed consent.

Exclusion criteria

Students with severe medical conditions.

Ethical considerations

The Institutional Ethical Committee (IEC) (Ref. no./IEC/IMS.SH/SOA/2023/599) approved the study protocol. Written informed consent was obtained from all participants before their inclusion in the study. Students were informed about the study's objectives, methodology, and potential risks and benefits. Participation was entirely voluntary, and confidentiality of the collected data was ensured.

Outcome Measurements

They collect data to find the ADHD students and then use it for the psychological factors of individuals with ADHD and those with co-occurring SU. Participants were initially screened using the Adult ADHD Self-Report Scale (ASRS-V1.1) [12]. Individual interviews using DSM-5 diagnostic criteria have objectively reevaluated those who meet the diagnostic criteria for ADHD in adults. Students diagnosed with ADHD as per DSM-5 criteria underwent further evaluation with the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) [13,14] to differentiate between individuals with ADHD alone and those with ADHD co-occurring with substance use. Participants were classified into two groups: ADHD without substance use and ADHD with substance use. All ADHD participants completed a set of standardized questionnaires, including the Hamilton Depression Rating Scale (HAM-D), a widely used clinician-administered assessment tool designed to evaluate the severity of depression in individuals. The HAM-D, created by Max Hamilton in 1960, has 17 to 24 items, with 17 questions making up the majority of versions. Each item is scored on a scale ranging from 0 to 2 or 0 to 4, depending on the symptom's severity, with a higher total score indicating more severe depression [15,16]. The Hamilton Anxiety Rating Scale (HAM-A) is a clinician-administered tool designed to assess the severity of anxiety symptoms in individuals. It consists of 14 items that Max Hamilton created in 1959 to assess both psychological and physical anxiety symptoms. These items include anxious mood, tension, fears, insomnia, difficulty concentrating, and physical symptoms such as dizziness, palpitations, and gastrointestinal distress. Each item is rated on a scale from 0 (not present) to 4 (severe), with a total score ranging from 0 to 56 [17,18]. Difficulties in Emotion Regulation Scale (DERS): Measures challenges in regulating emotions [19,21], and Barratt Impulsivity Scale (BIS) [21,22]: Assesses the personality trait of impulsivity.

Procedure

After receiving ethical clearance, participants were recruited according to established inclusion criteria to investigate the psychological factors associated with ADHD and its co-occurrence with substance use (SU). This study team observed each student using interview-based rating scales, such as the adult ASRS-V1.1, HAM-D, ASSIST-V3, HAM-A, and BIS, for

symptom assessment. Initial screening employed the Adult ADHD Self-Report Scale (ASRS-V1.1) to identify individuals meeting the diagnostic DSM-5 criteria for ADHD. Those identified were further assessed using the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) to categorize them into two groups: individuals with ADHD without SU and those with ADHD and SU. Participants completed a battery of standardized interview measures, including the Hamilton Anxiety Rating Scale (HAM-A), the Hamilton Depression Rating Scale (HAM-D), the Difficulties in Emotion Regulation Scale (DERS) to assess emotion regulation difficulties, and the Barratt Impulsivity Scale (BIS) to measure impulsivity. This flowchart provided comprehensive psychological factors for conducting a comparative analysis. The sample consisted of 105 adult students with ADHD, including 55 students with co-occurring substance use and 50 students without substance use (Figure 1).

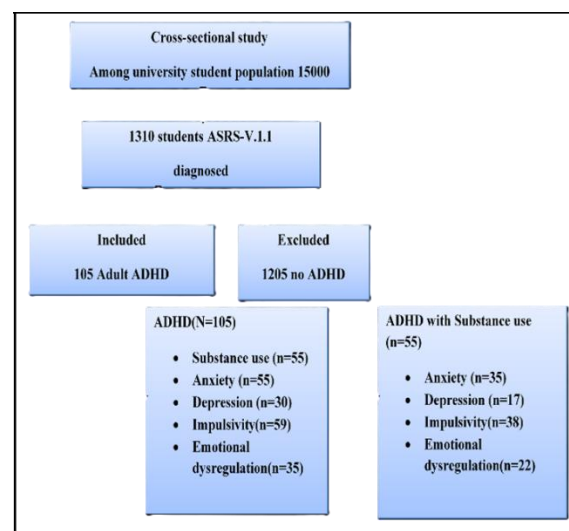


Figure 1: Flowchart of the study.

Statistical analysis

This analysis, conducted using SPSS Version 25, explored socio-demographic and psychological factors among individuals with ADHD. Students did descriptive statistics and chi-square analyses. The chi-square test utilized association as a significance test, with p -values less than 0.05 considered statistically significant.

RESULTS

The sample consisted of 105 adult students with ADHD, including 55 students with co-occurring substance use and 50 students without substance use, socio-demographic breakdown of individuals diagnosed with ADHD, and gender distribution within the study population. The sample predominantly comprises younger individuals, with 54.3% (57) falling within the 18-20 age range. The remaining 45.7% (48) are aged 21-26 years. A gender imbalance is observed, with 62.9% (66 participants) of the sample being male, compared to 37.1% (39) female,

with income above 10 lakh at 65.7% (69) and below 10 lakh at 34.3% (34.3%) (Table 1).

Table 1: Socio-demographic profile of the student with ADHD

Socio-demographic n(%)	
Age (18-26)	105(100)
Gender	
Female	39(37.1)
Male	66(62.9)
Income	
10 lakhs above	69(65.7)
Below 10 lakhs	36(34.3)

In a sample of 1,310 individuals, 105 (8.2%) were identified with ADHD, while 1,205 (91.8%) did not have ADHD. Among those with ADHD, 55 individuals (52.3%) reported substance use based on the WHO-ASSIST assessment, while 50 individuals (47.7%) with ADHD did not engage in substance use. According to the BIS scale, 59 (56.2%) of those with ADHD exhibited impulsivity, whereas 46 (43.8%) did not. Depression, assessed using the HAM-D scale, was observed in 30 individuals (28.6%) with ADHD, while 75 individuals (71.4%) did not experience depression. Anxiety, evaluated using the HAM-A scale, was found in 55 individuals (52.4%) with ADHD, while 50 individuals (47.6%) did not report anxiety. Emotional dysregulation, assessed using the DSER scale, was present in 35 individuals (33.3%) with ADHD, while 70 individuals (66.7%) did not exhibit emotional dysregulation (Table 2).

Table 2: Prevalence of psychological factors in individuals with and without ADHD

Category	n(%)	p-value
ADHD	105(8.2)	<0.05
Without ADHD	1205(91.8)	
WHO-ASSIST		
Substance use ADHD	55(52.3)	<0.05
Non-user with ADHD	50(47.7)	
BIS scale		
Impulsivity in ADHD	59(56.2)	<0.05
Without impulsivity in ADHD	46(43.8)	
HAM-D		
Depression in ADHD	30(28.6)	<0.05
Without depression in ADHD	75(71.4)	
HAM-A		
Anxiety in ADHD	55(52.4)	<0.05
Without anxiety in ADHD	50(47.6)	
DSER		
Emotional dysregulation in ADHD	35(33.3)	<0.05
Without emotional dysregulation in ADHD	70(66.7)	

This data highlights the distribution and clinical characteristics of ADHD, focusing on comorbid conditions like impulsivity, depression, anxiety, and emotional dysregulation. Statistical significance ($p < 0.05$) indicates meaningful differences or associations within the ADHD group.

Of ADHD students, 46.3% reported using tobacco. Impulsivity was the most common comorbidity (63.1%) among tobacco users, followed by anxiety (40%) and emotional dysregulation (40.1%). Interestingly, depression was lower (29.5%) among tobacco users compared to non-users (70.5%), suggesting that depression may not be a primary driver of tobacco use in this group. 21.8% of the ADHD students reported drinking alcohol. The highest co-occurrence was seen in individuals with anxiety (28.5%), while emotional dysregulation was the least associated (13.6%). Depression and impulsivity had moderate prevalence rates among

alcohol users at 29.5% and 21.3%, respectively, indicating alcohol use may not be strongly linked to emotional dysregulation in this student population. 30.9% of the students reported using cannabis, with depression being the most common condition (52.9%) among users. Anxiety (40%) and impulsivity (28.9%) were also common among cannabis users, suggesting that students with internalizing symptoms may be more prone to using cannabis. No students reported amphetamine use, indicating that stimulant misuse was not prevalent in this ADHD population. Inhalant use was absent in this study population. 18.1% of students reported using sedatives, with emotional dysregulation being the most prevalent comorbidity (27.3%) among sedative users. Anxiety and impulsivity were also present but at lower rates (17.2% and 13.2%, respectively). None of the students reported using hallucinogens, indicating that this category of substances may not be relevant to ADHD students in this sample. A small percentage (5.4%) of students reported opioid use, with anxiety (5.7%) and impulsivity (5.3%) being the most commonly associated conditions. Depression had no cases among opioid users, indicating that opioid use might be less appealing to individuals with depression in this group. Only 1.8% of students reported using other substances, and all cases were linked to impulsivity (2.4%). No associations were found with anxiety, depression, or emotional dysregulation (Table 3). The analysis uses the chi-square test and the Mantel-Haenszel common odds ratio (OR) with a 95% confidence interval (CI) and corresponding p-values. Impulsivity is significantly associated with ADHD and substance use, with 38 individuals showing impulsivity compared to 21 in the non-substance use group. The chi-square value of 7.808 and an OR of 3.087 (CI: 1.385-6.880) indicate that individuals with impulsivity are over three times more likely to have substance use compared to those without impulsivity. This association is statistically significant ($p = 0.005$). Emotional dysregulation does not show a significant relationship with substance use in individuals with ADHD. The chi-square value is 2.310, with an OR of 1.897 (CI: 0.827-4.355). This suggests that while emotional dysregulation is more common in the substance use group (22 vs. 13), the p-value of 0.129 indicates that the association is not statistically significant. Anxiety demonstrates a significant association with substance use in individuals with ADHD. The presence of anxiety is observed in 35 individuals in the substance use group compared to 20 in the non-substance use group. The chi-square value of 2.625 and an OR of 2.625 (CI: 1.193-5.776) suggest that individuals with anxiety are more than twice as likely to have substance use, with a statistically significant p-value of 0.016. Depression does not appear to be significantly associated with substance use in ADHD individuals. The presence of depression is similar in both groups (17 vs. 13), with a Chi-square value of 0.309 and an OR of 1.273 (CI: 0.543-2.986). The p-value of 0.543 suggests that the difference is not statistically significant, indicating that depression

alone may not be a key factor influencing substance use in individuals with ADHD (Table 4).

Table 3: Frequency distribution of substance use patterns among ADHD students with impulsivity, anxiety, depression, and emotional dysregulation

Substance uses pattern of ADHD groups		n=55 n(%)	Impulsivity With substance use (n=38)	Anxiety with substance us (n=35)	Depression with substance us (n=17)	Emotional dysregulation with substance use (n=22)
Tobacco	Yes	26(46.3)	24(63.1)	14(40)	5(29.5%)	9(40.1)
	No	29(52.7)	14(36.9)	21(60)	12(70.5%)	13(59.9)
Alcoholic beverages	Yes	12(21.8)	8(21.3)	10(28.5)	5(29.5%)	3(13.6)
	No	43(78.2)	30(78.7)	25(74.5)	12(70.5%)	19(86.4)
Cannabis	Yes	17(30.9)	11(28.9)	14(40)	9(52.9%)	8(36.4)
	No	38(69.1)	29(76.1)	21(60)	8(47.1%)	14(63.6)
Amphetamines	Yes	0	0	0	0	0
	No	55(100)	38(100)	35(100)	17(100%)	22(100)
Inhalants	Yes	0	0	0	0	0
	No	55(100)	38(100)	35(100)	17(100%)	22(100)
Sedatives	Yes	10(18.1)	5(13.2)	6(17.2)	2(11.7%)	6(27.3)
	No	45(81.9)	33(86.8)	29(82.8)	15(88.3%)	16(72.7)
Hallucinogens	Yes	0	0	0	0	0
	No	55(100)	38(100)	35(100)	17(100%)	22(100)
Opioids	Yes	3(5.4)	2(5.3)	2(5.7)	0	1(4.5)
	No	52(94.6)	36(94.7)	33(94.3)	17(100%)	21(95.5)
Other drugs	Yes	1(1.8)	1(2.4)	0	0	0
	No	54(98.2)	37(97.5)	35(100)	17(100%)	22(100)

Table 4: Association ADHD with substance use and without substance use among impulsivity, emotional dysregulation, anxiety, and depression

Psychological factors	ADHD with Substance use	ADHD without Substance use	Mantel-Haenszel Common OR (Asymptotic 95% CI)	p- value
Impulsivity	38	21	3.087(1.385-6.880)	0.005
Without Impulsivity	17	29		
Emotional dysregulation	29	13	1.897(0.827-4.355)	0.129
Without Emotional dysregulation	36	37		
Anxiety	35	20	2.625(1.193-5.776)	0.016
Without Anxiety	20	30		
Depression	17	13	1.273(0.543-2.986)	0.543
Without Depression	38	37		

DISCUSSION

The current study found a prevalence of 105 (8.2%) ADHD among university students diagnosed, and 55 individuals (52.3%) also had ADHD with substance use, aligning with findings from similar research regions in India [5]. The high rates of impulsivity (56.2%), depression (28.6%), anxiety (52.4%), and emotional dysregulation (33.3%), which are all mental disorders that happen at the same time, are similar to what other studies have found about the strong link between ADHD and emotional and behavioral dysregulation [23]. The study's findings reveal a predominance of younger individuals (18%) and a male-majority sample (62.9%). Previous research consistently shows ADHD to be more frequently diagnosed in males, possibly due to gender-based differences in symptom presentation and recognition. Previous studies by Ahmad *et al.* (2017) suggest that males often exhibit externalizing behaviors (e.g., impulsivity, hyperactivity), which may lead to earlier detection. Meanwhile, females are more likely to present with inattentive symptoms, which can be overlooked [24], and psychological comorbidities. The present study found that among individuals with ADHD (n=55), tobacco (46.3%), cannabis (30.9%), and alcohol (21.8%) were the most used substances. In contrast, Ganesan *et al.* (2021) reported lower overall substance use rates in a broader population, with alcohol (19.3%), tobacco (12.8%), and marijuana

(3.1%) being the most frequently used. Notably, while the present study found no use of amphetamines, inhalants, or hallucinogens, the Ganesan *et al.* study reported small but present usage rates of amphetamines (0.6%), inhalants (0.6%), and hallucinogens (0.4%). These findings suggest that individuals with ADHD may have higher rates of tobacco and cannabis use compared to the general population but exhibit lower or absent use of certain other substances [25]. The present study found tobacco was the most used substance, with a strong correlation to impulsivity. Doran *et al.* (2018) found that impulsivity components differentially predict tobacco use over time, indicating that motives and/or risk factors for tobacco use [26]. The current study scores are slightly higher than those reported for cannabis use and depression and emotional dysregulation. Cannabis use was significantly linked to both depression and emotional dysregulation [27]. The current study found that sedative use was higher among students with emotional dysregulation. It has been reported that the link between emotion dysregulation and the amount and frequency of substance use suggests that treating people who have trouble controlling their impulsive behaviors could be helpful for those who are addicted to drugs. Alcohol use was relatively lower, tobacco higher, with anxiety being the most common co-occurring condition. Tong *et al.* (2016) found a similar study on anxiety was associated with further increased risk behaviors of

smoking/drinking alcohol among those students with ADHD [28]. Opioid and other drug use was minimal, and there were no reported cases of amphetamine, inhalant, or hallucinogen use—similar to previous study findings [29]. The present study found heightened impulsivity in individuals with SUD, corroborating findings from similar studies that link impulsivity with increased risk for substance use in ADHD populations [30]. Kenézlői *et al.* (2025) showed that impulsivity and emotional dysregulation are core features of ADHD in adults, significantly impacting daily functioning, relationships, and overall well-being [31]. While impulsivity leads to hasty decision-making, difficulty delaying gratification, and risk-taking behaviors, emotional dysregulation [32] results in heightened sensitivity, mood swings, and difficulty managing frustration or stress [33]. The present study findings reveal a significant relationship, highlighting the role of impulsivity as a contributing factor to substance use behaviors. Impulsivity, characterized by a tendency to act without forethought or consideration of consequences, was strongly linked to substance use. The consistent presence of impulsivity as a risk factor emphasizes its importance in understanding and mitigating substance use in this population. A similar study by Robert *et al.* (2014) identified the facts of impulsivity and examined the relationship between ADHD symptoms and increased risk of use and abuse of substances [34]. The present study found poor emotional regulation was not linked to substance use with adult ADHD. In the previous research, Hirsch *et al.* (2014) found the heterogeneity of adult ADHD, emphasizing the importance of considering emotional regulation difficulties (ERD) when diagnosing and treating the disorder. Using confirmatory factor analysis and a person-centered approach, the research distinguished between positive and negative emotions and identified how poor emotion regulation skills contribute to ADHD symptomatology. The cluster analysis revealed two distinct subgroups: one with high ERD, characterized by more significant psychological distress, negative affect, and comorbidities such as somatoform disorders. Notably, women were more likely to fall into the high ERD cluster, underscoring the need for individualized treatment strategies based on emotional regulation profiles [35]. In a study performed by Ware *et al.* (2024), it was found that overall, the prevalence of co-occurring high-risk substance use, or substance use disorders (SUD), among youth (<18 years) with primary diagnoses of anxiety, depression, or ADHD in community mental health centers (CMHC). Findings reveal that approximately 5% of youth with anxiety and ADHD and 10% with depression have high-risk substance use or SUD [36]. The current study found that anxiety linked with substance use with ADHD and depression was not significant with substance use with ADHD.

Study limitations

The study's gender imbalance and age distribution limit generalizability, as the sample predominantly includes young males, potentially biasing the findings.

This study uses interview-based rating scales for each student, including the adult ASRS-V1.1, HAM-D, HAM-A, BIS, ASSIST, and DSER, for symptom assessment. The study's cross-sectional nature restricts the ability to infer causality among psychological factors, ADHD, and substance use. The relatively small sizes of subgroups, particularly those with substance use or emotional dysregulation, may reduce statistical power and the robustness of observed associations. Family history and comorbid psychiatric disorders were not considered, which might affect the results. Future research would benefit from longitudinal studies to better elucidate causal pathways and explore the temporal dynamics of these psychological factors. Moreover, incorporating neurobiological and environmental variables could provide a more comprehensive understanding of the mechanisms linking ADHD and substance use. Expanding the sample to include diverse populations beyond undergraduate students would enhance generalizability. Investigating the potential moderating role of factors such as emotional dysregulation or depression could further refine intervention strategies.

Conclusion

The current study highlights that impulsivity and anxiety have significant associations with substance use in ADHD individuals, while emotional dysregulation and depression do not show significant associations. Impulsivity showed a strong relationship with SU, underscoring its role as a primary driver of substance-related behaviors in this population. Similarly, anxiety was identified as an important correlation, suggesting that heightened emotional arousal may contribute to substance use tendencies. In contrast, emotional dysregulation and depression did not show significant associations with SU, indicating that their impact may be less direct or moderated by other factors. The findings show that substance use among ADHD students is primarily associated with impulsivity, anxiety, and emotional dysregulation. Tobacco was the most used substance, with a strong correlation to impulsivity. Cannabis use was significantly linked to depression, while sedative use was higher among students with emotional dysregulation. Alcohol use was relatively lower, tobacco higher, with anxiety being the most common co-occurring condition. Opioid and other drug use was minimal, and there were no reported cases of amphetamine, inhalant, or hallucinogen use.

Clinical implications

These findings have important implications for interventions targeting substance use among adult university students with ADHD. Given the strong association between impulsivity and substance use, intervention strategies should prioritize impulse control training, cognitive-behavioral techniques, and mindfulness-based approaches to enhance self-regulation. Additionally, addressing anxiety through stress management programs, counseling, and

relaxation techniques may help reduce substance use tendencies driven by emotional arousal. Since emotional dysregulation and depression did not show significant associations, interventions may be more effective when tailored to the specific risk factors of impulsivity and anxiety rather than focusing broadly on emotional distress. Implementing campus-based support systems that integrate these targeted approaches can enhance the well-being and academic success of students with ADHD.

Conflict of interests

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Data sharing statement

Supplementary data is available from the corresponding author upon reasonable request.

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