

Clinical Characteristics Associated with ASRS-Based Probable Adult ADHD Among Adults Receiving Treatment for Substance Use Disorders in Kenya

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Cite: Murage, L. W., Nyagwencha, S., Kihara, M. (2026). Clinical Characteristics Associated with ASRS-Based Probable Adult ADHD Among Patients Receiving Treatment for Substance Use Disorders in Kenya. *The University Journal*, 8(2 Sup. Issue II), 22-37.

Abstract

Adult Attention-Deficit/Hyperactivity Disorder (ADHD) commonly co-occurs with Substance Use Disorders (SUDs), yet evidence on associated clinical characteristics among treatment-seeking adults in Kenya remains limited. This cross-sectional analytical study examined clinical characteristics associated with ASRS-based probable adult ADHD among 322 adults recruited through total enumeration of eligible patients in six purposively selected rehabilitation centres in Nairobi, Kenya. Data were collected using a socio-demographic questionnaire, the Adult ADHD Self-Report Scale Version 1.1 (ASRS v1.1), Alcohol Use Disorders Identification Test (AUDIT), and Drug Abuse Screening Test (DAST-10). Bivariate analyses and multivariable binary logistic regression were used to examine associations with ADHD screening classification. Overall, 28.0% of participants met criteria for ASRS-based probable ADHD. Probable ADHD was associated with greater alcohol use severity ($r_{pb} = .301, p < .001$), greater drug use severity ($r_{pb} = .329, p < .001$), earlier age at first substance use ($r_{pb} = -.316, p < .001$), and polysubstance use ($\chi^2 = 22.11, p < .001$). In the adjusted model, each additional year in age at first substance use was associated with 13% lower odds of probable ADHD (aOR = 0.87, 95% CI [0.81, 0.93]), while polysubstance use was associated with approximately fivefold higher odds (aOR = 5.10, 95% CI [2.05, 12.72]); both $p < .001$. Earlier substance-use initiation and polysubstance use were independently associated with probable ADHD. These findings support consideration of ADHD screening followed by comprehensive clinical assessment within SUD treatment settings.

Key words: Adult Attention-Deficit/Hyperactivity Disorder (Adult ADHD), Substance Use Disorders (SUDs), SUD severity, Polysubstance use, Kenya

Introduction

Substance Use Disorders (SUDs) remain a major public health challenge, contributing substantially to morbidity, mortality, and psychosocial impairment worldwide. Their clinical management is frequently complicated by co-occurring psychiatric conditions, including Adult Attention-Deficit/Hyperactivity Disorder (ADHD) (Faraone et al., 2021; World Health Organization [WHO], 2024). Adult ADHD is a neurodevelopmental disorder characterised by persistent symptoms of inattention and/or hyperactivity–impulsivity that interfere with functioning across multiple domains of life (American

Psychiatric Association [APA], 2022). Among individuals with SUDs, co-occurring ADHD has been associated with earlier initiation of substance use, greater polysubstance involvement, more severe substance-related problems, psychiatric comorbidity, and poorer treatment outcomes (Breyer et al., 2014; Levy et al., 2014; Rohner et al., 2023). These findings suggest that ADHD may be associated with a distinct and potentially more complex clinical profile among individuals receiving treatment for SUDs.

Longitudinal and treatment-based studies have identified several substance-use characteristics associated with ADHD. Ilbegi et al. (2018) followed 189 participants in the Netherlands from a mean age of 11.3 years to 21.1 years to examine the relationship between ADHD developmental trajectories and subsequent substance-related outcomes. Persistent ADHD was associated with a significantly greater risk of developing an SUD (HR = 4.56, 95% CI [1.17, 17.81]) and higher rates of nicotine dependence compared with healthy controls, while elevated substance-related outcomes were also observed among participants with late-onset ADHD. Among individuals already receiving treatment for SUDs, Seitz et al. (2013) examined 385 adults undergoing treatment for alcohol dependence in Switzerland and found that those screening positive for probable ADHD experienced greater alcohol craving, more severe withdrawal symptoms, greater psychiatric distress, and higher levels of recent substance use than those screening negative. ADHD-positive participants also reported greater use of additional substances, including cannabis, cocaine, and amphetamines. Together, these findings indicate that ADHD is associated with multiple dimensions of substance-use vulnerability and clinical complexity rather than with SUD occurrence alone.

Evidence from African treatment populations remains comparatively limited and suggests that these clinical differences may extend to substance-use patterns, severity, and associated impairment. In Egypt, Abdel-Fadeel et al. (2023) examined 119 inpatients with SUDs using the Adult ADHD Self-Report Scale (ASRS v1.1) and Addiction Severity Index (ASI). Participants with lifetime ADHD demonstrated greater addiction-related impairment, particularly in the medical and legal domains, although differences in the alcohol and drug domains were not statistically significant. In another Egyptian study, El Rasheed et al. (2023) examined 30 women with SUDs and found that those with probable ADHD initiated smoking and substance use at younger ages and experienced greater employment and family/social impairment than those without probable ADHD. However, differences in the alcohol and drug domains of the ASI were not statistically significant. These findings demonstrate variability in the clinical characteristics associated with ADHD across treatment populations and suggest that associations with substance-use severity and related characteristics may differ according to population, substance-use patterns, and measurement approach.

Several mechanisms may contribute to these associations. The Behavioral Disinhibition Hypothesis proposes that ADHD-related impulsivity, impaired inhibitory control, novelty-seeking, and executive dysfunction may increase vulnerability to early and poorly regulated substance use by reducing the capacity to inhibit behaviour and consider longer-term consequences (Faraone et al., 2009; Young & Sedgwick, 2015). These characteristics may contribute to earlier substance initiation, involvement with multiple substances, and greater substance-related problems. The Self-Medication Hypothesis provides a complementary explanation, proposing that some individuals may use alcohol or other psychoactive substances to alleviate ADHD-related inattention, restlessness, or emotional dysregulation (Khantzian, 1997; Spera et al., 2020). Repeated substance use for symptom

regulation may subsequently contribute to escalating or persistent patterns of use. Although the cross-sectional design of the present study cannot establish these mechanisms or determine temporal relationships, these theoretical perspectives provide a basis for examining the clinical characteristics associated with ADHD screening status among individuals already receiving treatment for SUDs.

In Kenya, evidence concerning co-occurring Adult ADHD and SUDs remains limited. Jenkins et al. (2015) documented ADHD symptoms within a Kenyan community population, while Oigara (2022) examined adults receiving treatment for SUDs in three rehabilitation centres in Nairobi and reported that 25.4% screened positive for probable ADHD using the ASRS v1.1. However, existing Kenyan evidence has primarily focused on the occurrence of ADHD symptoms rather than examining whether ADHD screening status is associated with clinically relevant substance-use characteristics, including alcohol- and drug-related severity, age at first substance use, and polysubstance involvement. Consequently, the clinical profile associated with positive ADHD screening among adults receiving SUD treatment in Kenyan rehabilitation settings remains insufficiently characterised.

International frameworks, including the WHO Comprehensive Mental Health Action Plan (2023–2030) and the United Nations Office on Drugs and Crime International Standards for the Treatment of Drug Use Disorders, emphasise integrated approaches to co-occurring mental health and substance use conditions. Identifying clinical characteristics associated with positive ADHD screening within Kenyan rehabilitation settings may help inform the identification of individuals who warrant comprehensive ADHD assessment and support more integrated approaches to clinical assessment and treatment planning. Accordingly, this study examined clinical characteristics associated with ASRS-based probable Adult ADHD among adults receiving treatment for SUDs in selected rehabilitation centres in Nairobi, Kenya, with particular attention to alcohol- and drug-related severity, age at first substance use, and polysubstance use.

Theoretical Framework

The present study was guided by the Behavioral Disinhibition Hypothesis (BDH), which proposes that behavioural characteristics associated with Attention-Deficit/Hyperactivity Disorder (ADHD), particularly impulsivity, impaired inhibitory control, novelty seeking, and executive dysfunction, may increase vulnerability to substance use and Substance Use Disorders (SUDs) (Faraone et al., 2009; Young & Sedgwick, 2015). According to this perspective, difficulties regulating behaviour and considering longer-term consequences may contribute to earlier initiation of substance use, engagement with multiple substances, and persistence of substance use despite adverse consequences. The BDH therefore provides a theoretical basis for examining whether individuals with ADHD symptoms exhibit different or more severe substance-use characteristics than those without ADHD symptoms.

Empirical evidence provides support for several components of this framework. ADHD and SUDs have been associated with deficits in cognitive control and inhibitory functioning, heightened impulsivity, and shared genetic and neurobiological vulnerabilities (Paraskevopoulos et al., 2021; Rocha et al., 2024). Neuropsychological research has also identified impaired response inhibition among individuals with ADHD and stimulant dependence, suggesting potential overlap in mechanisms implicated in

behavioural regulation (Groman et al., 2009). Longitudinal studies further suggest that impulsivity and sensation-seeking are associated with subsequent substance-use behaviours, although the relative contribution of executive dysfunction and other behavioural characteristics varies across populations (Handley et al., 2011; Palmer et al., 2013).

In the present study, the BDH provided a conceptual basis for examining age at first substance use, polysubstance use, and alcohol- and drug-related severity as clinical characteristics associated with ASRS-based probable Adult ADHD. Earlier substance initiation and involvement with multiple substances are theoretically consistent with greater behavioural disinhibition and risk-taking, while greater substance-related severity may reflect difficulty regulating substance-use behaviour once established. However, the present study did not directly measure behavioural disinhibition or test the causal mechanisms proposed by the BDH. Rather, the framework was used to guide the selection and interpretation of clinical characteristics examined in relation to ADHD screening status.

Methodology

This study employed a cross-sectional analytical design to examine clinical characteristics associated with ASRS-based probable Adult Attention-Deficit/Hyperactivity Disorder (ADHD) among adults receiving treatment for Substance Use Disorders (SUDs). The study was conducted in six drug and alcohol rehabilitation centres in Nairobi County, Kenya, selected from 14 facilities licensed by the National Authority for the Campaign Against Alcohol and Drug Abuse (NACADA) at the time of the study. The centres were purposively selected because they provided structured addiction treatment programmes for adults, maintained adequate patient records, and granted permission for study participation. The participating centres and the number of eligible and enrolled participants at each site are presented in Table 1.

Table 1

Eligible Population and Participant Recruitment Across the Participating Rehabilitation Centres

Rehabilitation Centre	Eligible Patients, n	Participants Recruited, n
Asumbi Treatment Centre	70	58
Dove Mental Health Hospital	120	94
Eden House Rehabilitation Centre	50	43
Nairobi Place Specialized Medical Centre	40	39
New Chapter Place Counselling and Rehabilitation Centre	50	37
The Optimum Center for Specialized Treatment	60	51
Total	390	322

Data were collected between 10 January and 30 March 2026. To minimise the potential influence of acute intoxication and withdrawal symptoms on self-reported ADHD and substance-use characteristics, data collection was undertaken after participants had completed the initial detoxification phase of treatment, approximately two weeks following admission.

The study population comprised adults aged 18–65 years receiving treatment for SUDs in the six selected rehabilitation centres. During the data collection period, 390 patients met the initial eligibility criteria. A total enumeration approach was used within the selected centres, whereby all eligible patients available during the study period were invited to participate. Participants were eligible if they were aged 18–65 years, were receiving treatment for a SUD, had completed the initial detoxification phase, were clinically stable to complete the questionnaires, and were able to provide informed consent. Individuals with severe cognitive impairment or acute psychiatric symptoms that compromised their ability to provide informed consent or meaningfully complete the study questionnaires were excluded. Of the 390 eligible patients invited to participate, 322 completed the study and were included in the analysis, representing a response rate of 82.6%. Forty-four eligible patients declined participation, while 24 returned incomplete questionnaires and were excluded from the analysis.

Measures

Data were collected using a socio-demographic and clinical questionnaire and three standardised instruments: the Adult ADHD Self-Report Scale Version 1.1 (ASRS v1.1), the Alcohol Use Disorders Identification Test (AUDIT), and the Drug Abuse Screening Test (DAST-10). The socio-demographic and clinical questionnaire collected information on participant characteristics, including age, sex, age at first substance use, previous treatment for SUDs, and substances used. Polysubstance use was operationalised as use of two or more psychoactive substances by the same individual, either concurrently or over a specified period of time (Connor et al., 2014). In this study, respondents were categorized as either polysubstance users or single-substance users based on their self-reported substance use history.

The ASRS v1.1 is an 18-item self-report screening instrument corresponding to the DSM symptom domains of Inattention and Hyperactivity–Impulsivity. In the present study, the ASRS v1.1 demonstrated excellent internal consistency (Cronbach's $\alpha = .95$). Participants were initially classified as having ASRS-based probable Adult ADHD if they endorsed four or more Part A screening items according to the recommended ASRS scoring algorithm and reported symptom onset before 12 years of age. ADHD symptom presentations were subsequently derived from responses to all 18 ASRS items by allocating Items 1–4 and 7–11 to the Inattention domain and Items 5–6 and 12–18 to the Hyperactivity–Impulsivity domain. Participants endorsing five or more symptoms within the Inattention domain only were classified as having the predominantly inattentive presentation, those endorsing five or more symptoms within the Hyperactivity–Impulsivity domain only were classified as having the predominantly hyperactive–impulsive presentation, and those meeting symptom thresholds in both domains were classified as having the combined presentation. These classifications represent ASRS-based probable Adult ADHD symptom presentations rather than clinically confirmed DSM-5-TR diagnoses.

The AUDIT is a 10-item instrument developed by the World Health Organization to assess hazardous and harmful alcohol use and symptoms of alcohol dependence. Total scores range from 0 to 40, with higher scores indicating greater alcohol-related severity. In the present study, the total AUDIT score was analysed as a continuous measure of alcohol-related SUD severity. The AUDIT demonstrated good internal consistency in the study sample, with a Cronbach's alpha of .89.

The DAST-10 is a 10-item screening instrument assessing drug-related problems, excluding alcohol and tobacco. Scores range from 0 to 10, with higher scores indicating greater drug-related severity. Total DAST-10 scores were analysed as a continuous measure of drug-related SUD severity. The DAST-10 also demonstrated good internal consistency in the study sample, with a Cronbach's alpha of .89.

Data Collection Procedures

Questionnaires were administered between 10 January and 30 March 2026 after eligible participants had completed approximately two weeks of detoxification and were considered clinically stable to participate. Following written informed consent, participants completed the study questionnaires independently, with trained research assistants available. Research assistants followed standardised administration procedures to minimise variation across study sites. Completed questionnaires were reviewed for completeness before data entry. Participants were assigned unique identification codes, and no personally identifying information was included in the analytical dataset.

Study Variables

The primary outcome variable was ASRS-based probable Adult ADHD screening classification, coded as [0 = negative, 1 = positive]. Clinical characteristics examined in relation to ADHD screening classification included alcohol-related severity (AUDIT total score), drug-related severity (DAST-10 total score), age at first substance use, polysubstance use, and previous SUD treatment. Age and sex were also examined as participant characteristics and were included in the multivariable analysis.

Statistical Analysis

Data were entered, cleaned, and analysed using IBM SPSS Statistics Version 27. Participant characteristics were summarised using frequencies and percentages for categorical variables and means and standard deviations for continuous variables, as appropriate.

Bivariate analyses were conducted to examine relationships between ADHD screening classification and clinical characteristics. Point-biserial correlations were used to examine associations between the dichotomous ADHD screening classification and continuous variables, including AUDIT and DAST-10 scores and age at first substance use. Pearson correlations were used for relationships between continuous variables. Independent-samples *t*-tests were used to compare mean AUDIT and DAST-10 scores according to ADHD screening classification, with Welch's correction applied where the assumption of homogeneity of variance was violated. Associations between categorical variables, including ADHD screening classification and polysubstance use, were examined using

Pearson's chi-square tests, with effect sizes reported using phi or Cramer's V as appropriate.

A multivariable binary logistic regression model was used to examine characteristics independently associated with ASRS-based probable adult ADHD screening classification. Age, sex, age at first substance use, and polysubstance use were entered simultaneously as explanatory variables. Adjusted odds ratios (aORs) with 95% confidence intervals (CIs) were reported for each predictor. Overall model performance was assessed using the omnibus likelihood-ratio test and Nagelkerke R². Relevant model assumptions, including multicollinearity and linearity of the logit for continuous predictors, were assessed before interpretation. Statistical significance was evaluated using a two-sided α level of .05.

Ethical Considerations

Ethical approval was obtained from the United States International University–Africa Institutional Scientific and Ethics Review Committee (ISERC No. USIU-A/ISERC/US1209-2025), and research authorisation was granted by the National Commission for Science, Technology and Innovation (NACOSTI Permit No. 855839). Written informed consent was obtained from all participants before enrolment. Confidentiality and anonymity were maintained through unique identification codes and secure storage of study data. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (World Medical Association, 2013).

Results

Participant Characteristics

A total of 322 participants were included in the analysis. The demographic and clinical characteristics of the sample are presented in Table 2. Most participants were aged 26–35 years (44.1%), were male (67.7%), and were single (58.0%). Approximately 46.6% reported previous treatment for a substance use disorder (SUD). Substance use was most commonly initiated between 16 and 20 years of age (46.3%), while 32.3% reported initiating substance use at 15 years of age or younger.

Table 2

Demographic and Clinical Characteristics of Participants (N = 322)

Characteristic	n	%
Age group (years)		
18–25	56	17.4
26–35	142	44.1
36–45	83	25.8
46–55	22	6.8
≥56	19	5.9
Sex		
Male	218	67.7%
Female	104	32.3%
Marital status		
Single	187	58%

Married	86	27%
Separated	27	8%
Divorced	18	6%
Widowed	4	1%
Highest level of education		
Postgraduate	54	16.8%
Undergraduate	111	34.5%
College Level	99	30.7%
Secondary	55	17.1%
Primary	2	0.6%
No Formal Education	1	0.3%
Employment status		
Employed Full Time	127	39%
Employed Part Time	15	5%
Self-employed	80	25%
Unemployed	69	21%
Student	30	9%
Other	1	1%
Previous treatment for SUD		
Yes	150	46.6
No	172	53.4
Age at first substance use (years)		
≤15	104	32.3
16–20	149	46.3
21–25	51	15.8
>25	18	5.6

Prevalence of ASRS-Based Probable Adult ADHD

Of the 322 participants, 90 (28.0%) met the study criteria for ASRS-based probable adult ADHD, while 232 (72.0%) did not meet the screening criteria.

Substance Use Severity According to ADHD Screening Classification

Participants with ASRS-based probable adult ADHD had higher mean alcohol- and drug-related severity scores than participants without probable ADHD. The mean AUDIT score among participants with probable ADHD was 28.81 (SD = 9.04), compared with 21.88 (SD = 10.19) among participants without probable ADHD. This difference was statistically significant, Welch's $t(181.38) = 5.96, p < .001$.

Similarly, participants with probable ADHD had a higher mean DAST-10 score (M = 6.59, SD = 2.83) than those without probable ADHD (M = 4.08, SD = 3.38). The difference was also statistically significant, Welch's $t(192.14) = 6.76, p < .001$.

Table 3*Substance Use Severity According to ASRS-Based Probable ADHD Classification*

Measure	No probable ADHD (n = 232), M (SD)	Probable ADHD (n = 90), M (SD)	Test statistic	p
AUDIT	21.88 (10.19)	28.81 (9.04)	Welch's $t(181.38)$ = 5.96	< .001
DAST-10	4.08 (3.38)	6.59 (2.83)	Welch's $t(192.14)$ = 6.76	< .001

Note. AUDIT = Alcohol Use Disorders Identification Test; DAST-10 = Drug Abuse Screening Test-10.

Bivariate Associations With ASRS-Based Probable Adult ADHD

Point-biserial correlations were used to examine associations between ASRS-based probable ADHD classification and continuous clinical variables. Probable ADHD was positively associated with alcohol use severity, $r_{pb} = .301$, $p < .001$, and drug use severity, $r_{pb} = .329$, $p < .001$. These findings indicate that participants classified as having probable ADHD tended to report higher AUDIT and DAST-10 scores. Age at first substance use was negatively associated with probable ADHD classification, $r_{pb} = -.316$, $p < .001$, indicating that participants who initiated substance use at a younger age were more likely to meet the study criteria for probable ADHD. Among the continuous clinical variables, age at first substance use was negatively correlated with both AUDIT scores, $r = -.196$, $p < .001$, and DAST-10 scores, $r = -.253$, $p < .001$. AUDIT and DAST-10 scores were weakly but positively correlated, $r = .158$, $p = .004$.

Table 4*Correlations Between Age at First Substance Use, Substance Use Severity, and ASRS-Based Probable ADHD*

Variable	1	2	3	4
1. Age at first substance use	—			
2. AUDIT score	-.196**	—		
3. DAST-10 score	-.253**	.158**	—	
4. ASRS-based probable ADHD	-.316**	.301**	.329**	—

Note. Correlations involving ASRS-based probable ADHD classification are point-biserial correlations; correlations between continuous variables are Pearson correlations.

** $p < .01$.

Association Between ASRS-Based Probable ADHD and Polysubstance Use

A Pearson chi-square test was conducted to examine the association between ASRS-based probable adult ADHD and polysubstance use. Polysubstance use was reported by 93.3% of participants with probable ADHD compared with 68.1% of participants without probable ADHD. Conversely, 6.7% of participants with probable ADHD reported no polysubstance use compared with 31.9% of those without probable ADHD. The association between probable ADHD classification and polysubstance use was statistically

significant, $\chi^2(1, N = 322) = 22.11, p < .001, \phi = .26$, indicating a small-to-moderate association.

Table 5

Distribution of Polysubstance Use According to ASRS-Based Probable ADHD Classification

ADHD classification	No polysubstance use, n (%)	Polysubstance use, n (%)	Total
No ASRS-based probable ADHD	74 (31.9)	158 (68.1)	232
ASRS-based probable ADHD	6 (6.7)	84 (93.3)	90
Total	80 (24.8)	242 (75.2)	322

Multivariable Factors Associated With ASRS-Based Probable Adult ADHD

A multivariable binary logistic regression analysis was conducted to examine factors independently associated with ASRS-based probable adult ADHD. Age, sex, age at first substance use, and polysubstance use were entered simultaneously into the model. The overall model was statistically significant, $\chi^2(4, N = 322) = 53.63, p < .001$, with a Nagelkerke R^2 of .221. Age at first substance use and polysubstance use remained independently associated with probable ADHD after adjustment for age and sex. Each one-year increase in age at first substance use was associated with approximately 13% lower odds of probable ADHD (aOR = 0.87, 95% CI [0.81, 0.93], $p < .001$).

Participants reporting polysubstance use had approximately five times the odds of being classified as having probable ADHD compared with participants who did not report polysubstance use (aOR = 5.10, 95% CI [2.05, 12.72], $p < .001$). Age was not independently associated with probable ADHD (aOR = 1.01, 95% CI [0.98, 1.05], $p = .411$). Female participants had higher estimated odds of probable ADHD than male participants, although the association did not reach statistical significance (aOR = 1.73, 95% CI [0.97, 3.07], $p = .064$).

Table 6

Multivariable Logistic Regression of Factors Associated With ASRS-Based Probable Adult ADHD

Predictor	B	aOR	95% CI for aOR	p
Age	0.013	1.01	0.98–1.05	.411
Female sex ¹	0.546	1.73	0.97–3.07	.064
Age at first substance use	−0.142	0.87	0.81–0.93	< .001
Polysubstance use ²	1.629	5.10	2.05–12.72	< .001

Note. N = 322. aOR = adjusted odds ratio; CI = confidence interval. ¹Reference category = male. ²Reference category = no polysubstance use. Overall model: $\chi^2(4) = 53.63, p < .001$; Nagelkerke $R^2 = .221$.

Discussion

The present study found that ASRS-based probable adult ADHD was associated with greater substance use disorder (SUD) severity and more complex patterns of substance use among adults receiving treatment for SUDs in selected rehabilitation centres in Nairobi, Kenya. Participants who screened positive for probable ADHD had significantly higher mean AUDIT and DAST-10 scores than those who did not screen positive. Probable ADHD was also positively associated with both alcohol- and drug-related severity at the bivariate level. In addition, participants with probable ADHD were substantially more likely to report polysubstance use and tended to have initiated substance use at a younger age. In the multivariable analysis, age at first substance use and polysubstance use remained independently associated with probable ADHD after adjustment for age and sex, whereas age and sex were not statistically significant independent factors.

Participants with ASRS-based probable ADHD demonstrated significantly greater alcohol- and drug-related severity than those without probable ADHD. The mean AUDIT score was 28.81 among participants with probable ADHD compared with 21.88 among those without probable ADHD, while corresponding mean DAST-10 scores were 6.59 and 4.08, respectively. Consistent with these group differences, probable ADHD was positively associated with alcohol use severity ($r_{pb} = .301, p < .001$) and drug use severity ($r_{pb} = .329, p < .001$). Although these associations were modest in magnitude, their consistency across both alcohol- and drug-related measures suggests that probable ADHD may identify a subgroup of individuals receiving SUD treatment who experience greater substance-related clinical burden.

These findings are broadly consistent with previous research demonstrating an association between ADHD and adverse substance use outcomes. Ameringer et al. (2013), using data from the National Epidemiologic Survey on Alcohol and Related Conditions involving 43,093 adults in the United States, found that both hyperactive-impulsive and inattentive ADHD symptoms remained significantly associated with several substance classes after accounting for comorbid dependence diagnoses. Similarly, Lee et al. (2011), in a meta-analysis of 27 longitudinal studies, reported increased risks of several substance-related outcomes among individuals with childhood ADHD, including nicotine dependence (OR = 2.82), alcohol abuse or dependence (OR = 1.74), marijuana use disorder (OR = 1.58), and cocaine dependence (OR = 2.05). Although the present cross-sectional findings cannot establish whether ADHD preceded or contributed to the development of more severe SUD, they are consistent with the wider literature indicating that ADHD and problematic substance use frequently co-occur and may be associated with greater clinical severity.

The association between probable ADHD and polysubstance use provides further evidence of greater substance-use complexity in this group. Polysubstance use was reported by 93.3% of participants with probable ADHD compared with 68.1% of participants without probable ADHD, representing a statistically significant small-to-moderate association ($\phi = .26$). This pattern is consistent with research suggesting that substance use among individuals with ADHD may extend across multiple substance classes rather than being restricted to a single drug. Miranda et al. (2016), for example, found higher rates of alcohol, tobacco, and marijuana use among young adults with a history of childhood ADHD compared with controls. They further observed that co-occurring externalising difficulties were associated with poorer substance-use outcomes, highlighting the potential contribution of behavioural dysregulation and related psychopathology. Although

externalising disorders were not assessed in the present study, the high prevalence of polysubstance use among participants with probable ADHD may similarly reflect a more complex clinical presentation requiring comprehensive assessment.

Age at first substance use also emerged as an important correlate of probable ADHD. Earlier initiation was associated with higher alcohol severity ($r = -.196$, $p < .001$), higher drug-related severity ($r = -.253$, $p < .001$), and a greater likelihood of probable ADHD ($r_{pb} = -.316$, $p < .001$). Importantly, this relationship persisted in the multivariable analysis. After adjustment for age, sex, and polysubstance use, each additional year in age at first substance use was associated with approximately 13% lower odds of screening positive for probable ADHD (aOR = 0.87, 95% CI [0.81, 0.93], $p < .001$). Comparable findings were reported by Ganesh et al. (2017), who examined 240 treatment-seeking adults with SUDs in Southern India and found that individuals with early-onset substance dependence were more likely to screen positive for ADHD than those with later-onset dependence (59.3% vs. 35.5%, $p = .013$). Taken together, these findings indicate a relationship between earlier substance-use initiation and ADHD-related vulnerability. However, because the present study was cross-sectional, it cannot determine whether ADHD-related characteristics contributed to earlier substance initiation, whether early substance exposure influenced later symptom reporting, or whether both are related to other underlying developmental or environmental factors.

Polysubstance use showed the strongest independent association with probable ADHD in the multivariable model. Participants reporting polysubstance use had approximately five times the odds of screening positive for probable ADHD compared with those who did not report polysubstance use (aOR = 5.10, 95% CI [2.05, 12.72], $p < .001$), after adjustment for age, sex, and age at first substance use. In contrast, age and sex were not independently associated with probable ADHD after adjustment. The overall model was statistically significant and had a Nagelkerke R^2 of .221, suggesting that the included characteristics accounted for a meaningful, although incomplete, proportion of variation in ADHD screening classification. The remaining unexplained variation indicates that other factors not included in the present model, such as psychiatric comorbidity, childhood behavioural difficulties, family history, environmental adversity, or characteristics of specific substances, may also be relevant.

The findings may be understood in relation to the complementary mechanisms proposed by the Behavioral Disinhibition Hypothesis (BDH) and the Self-Medication Hypothesis (SMH). From a BDH perspective, characteristics associated with ADHD, including impulsivity, novelty seeking, and difficulties with inhibitory control, may be related to earlier initiation and engagement with multiple substances. The strong association observed between probable ADHD and polysubstance use, together with the relationship between ADHD classification and younger age at substance-use initiation, is consistent with this explanation. The SMH offers a complementary perspective in which some individuals may use alcohol or other substances in an attempt to manage difficulties such as restlessness, inattention, or emotional dysregulation. The greater alcohol- and drug-related severity observed among participants with probable ADHD is compatible with this possibility. Nevertheless, the present study did not directly measure motives for substance use, impulsivity, self-medication behaviour, or the temporal ordering of ADHD symptoms and substance use. The findings therefore support the theoretical plausibility of these mechanisms but should not be interpreted as direct evidence that either mechanism caused the observed associations.

Limitations and Generalisability

Several limitations should be considered when interpreting the findings. First, the cross-sectional design does not permit determination of temporal sequence or causal relationships between ADHD symptoms and substance use characteristics. The observed associations between ASRS-based probable ADHD, earlier substance-use initiation, polysubstance use, and greater SUD severity may be bidirectional or may reflect shared underlying factors that were not measured in this study.

Second, ADHD classification was based on the Adult ADHD Self-Report Scale (ASRS) rather than a structured clinical diagnostic assessment. The findings therefore represent ASRS-based probable ADHD and should not be interpreted as confirmed ADHD diagnoses. Although the screening classification incorporated reported childhood symptom onset, symptoms related to substance intoxication, withdrawal, other psychiatric conditions, or overlapping behavioural difficulties may have contributed to symptom reporting. This may have resulted in some misclassification of ADHD screening status.

Third, information on substance-use history and age at first substance use was based on retrospective self-report and was therefore susceptible to recall and reporting bias. Recall of the precise age at which substance use was initiated may be particularly difficult for participants with long histories of substance use. The extent and direction of any resulting misclassification cannot be determined from the present data.

Fourth, although the multivariable analysis adjusted for age, sex, age at first substance use, and polysubstance use, residual confounding remains possible. Potentially relevant factors such as psychiatric comorbidity, childhood behavioural difficulties, family history of ADHD or SUD, socioeconomic adversity, duration and frequency of substance use, and characteristics of individual substances were not included in the model. Consequently, the adjusted associations observed for age at first substance use and polysubstance use should not be interpreted as independent causal effects.

Finally, participants were recruited from selected rehabilitation centres in Nairobi and were receiving treatment for SUDs. The findings are therefore most applicable to adults in similar treatment settings and may not be generalisable to individuals with substance use problems who are not seeking treatment, community populations, adolescents, or treatment populations in other regions of Kenya. Nevertheless, recruitment across multiple rehabilitation centres provides evidence from a clinically relevant treatment-seeking population and contributes data from a setting in which evidence on co-occurring adult ADHD and SUD remains limited.

Conclusion

ASRS-based probable adult ADHD was associated with greater alcohol- and drug-related severity, earlier initiation of substance use, and a higher prevalence of polysubstance use among adults receiving SUD treatment in selected rehabilitation centres in Nairobi. In the adjusted analysis, earlier age at first substance use and polysubstance use remained independently associated with probable ADHD, whereas age and sex were not statistically significant independent factors. These findings identify a subgroup of adults receiving SUD treatment who may have additional clinical assessment needs. Longitudinal studies incorporating comprehensive diagnostic assessment are needed to clarify the temporal

relationships between ADHD, substance-use initiation, polysubstance involvement, and SUD severity.

Practical Implications

The findings provide context-specific evidence on the clinical characteristics associated with ASRS-based probable adult ADHD among adults receiving SUD treatment in Kenya. Given the higher substance-use severity and prevalence of polysubstance use observed among participants who screened positive for probable ADHD, consideration of ADHD screening within SUD treatment services may facilitate identification of individuals who warrant further clinical assessment. Screening should not be considered equivalent to diagnosis but may provide a basis for referral for comprehensive ADHD evaluation where indicated. Greater recognition of possible co-occurring ADHD may also support more comprehensive assessment and integrated treatment planning within rehabilitation settings.

Recommendations

Healthcare professionals working in SUD treatment settings should be attentive to possible co-occurring adult ADHD, particularly among individuals presenting with earlier initiation of substance use, polysubstance use, or greater substance-use severity. Where ADHD is suspected or identified through screening, further clinical assessment may be warranted to distinguish persistent ADHD symptoms from substance-induced or withdrawal-related presentations and to inform appropriate treatment planning.

Further research using larger and more diverse samples, structured diagnostic assessments, and longitudinal designs is recommended to confirm these findings and clarify the temporal relationships between ADHD and substance-use patterns. Future studies should also examine the feasibility and clinical utility of ADHD screening within SUD treatment settings in Kenya.

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