Research Square

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PTSD Symptoms and Childhood Maltreatment Influence Alcohol and Drug Addiction Severity

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Abstract

Background

Trauma and post-traumatic stress disorder (PTSD) are critical factors influencing the onset, presentation, and prognosis of substance use disorders (SUDs). This study aimed to determine the prevalence of trauma and lifetime PTSD in a treatment-seeking SUD population in Hong Kong, and to examine cross-sectional associations between PTSD symptom clusters, childhood trauma subtypes, and alcohol and drug addiction severity.

Methods

In this cross-sectional study, 160 Chinese adults from inpatient and outpatient substance misuse units were assessed using the Clinician-Administered PTSD Scale (CAPS), Addiction Severity Index (ASI), Life Event Checklist (LEC), and the Childhood Trauma Questionnaire (CTQ). Two-stage multivariable linear regression models identified factors independently associated with addiction outcomes.

Results

Lifetime trauma exposure was reported by 80.0% of the sample, and 39.4% met criteria for lifetime PTSD. For alcohol addiction severity (R^2_{adj} = .52, p < .001), lifetime PTSD, higher CAPS re-experiencing, and higher CAPS avoidance/numbing severity were independent positive correlates. For drug addiction severity (R^2_{adj} = .65, p < .001), lifetime PTSD and higher CAPS avoidance/numbing severity, but not re-experiencing, were independent positive correlates. Continuous subscale analysis revealed that childhood sexual abuse and emotional neglect independently predicted higher alcohol and drug severity (p ≤ .011).

Conclusions

Trauma pathology and childhood maltreatment are common among individuals seeking treatment for SUD in Hong Kong. The unique association of re-experiencing symptoms with alcohol severity, alongside the association of avoidance/numbing with both alcohol and drug addiction, highlights a distinct symptom-substance co-occurrence profile. These findings underscore the need for trauma-informed frameworks and integrated PTSD treatment within addiction services.

Highlights

- Lifetime trauma exposure was reported by 80.0% of individuals seeking treatment for substance use disorder, and 39.4% met criteria for lifetime PTSD.

- Lifetime PTSD diagnosis and more severe symptoms of avoidance/numbing are associated with drug and alcohol addiction. While more severe re-experience symptoms were also found to be associated with alcohol addiction.

- Childhood sexual abuse and emotional neglect independently predicted higher severity across both substance domains.

INTRODUCTION

Substance use disorders (SUDs) represent a major global public health challenge, with alcohol and drug use disorders accounting for over 99 million and 31 million disability-adjusted life years, respectively (1), and carrying the highest standardized mortality ratio among psychiatric disorders (2). Trauma exposure is nearly universal among individuals with SUD seeking treatment. Between 75.4% to 100% of SUD patients report trauma exposure, and 23.9% to 42.9% developed PTSD (3–5), which is in stark contrast to 5.6% in the general population following trauma exposure (6). PTSD is characterised by intrusive re-experiencing of traumatic events, persistent avoidance of trauma-related stimuli, negative alterations in cognition and mood, and hyperarousal (7), and its co-occurrence with SUD is associated with greater addiction severity, higher rates of suicidality, poorer treatment engagement, and worse long-term prognosis than SUD alone (8–10). Understanding the nature, prevalence, and clinical correlates of PTSD within the SUD treatment populations would inform clinical care for SUD.

Several theoretical models have been proposed to explain the high co-occurrence of PTSD and SUD. The self-medication hypothesis posits that substances are used to alleviate the aversive emotional states characteristic of PTSD (11). Further studies supported pharmacological specificity in substance choice based on the nature of PTSD symptoms. Alcohol use was most consistently associated with avoidance symptoms (12–14), with one study suggesting an association with hyperarousal symptoms (15). For other substances, increased opioid use is associated with avoidance symptoms or arousal/ reactivity symptoms (16,17), and craving in stimulant users is associated with avoidance symptoms (18). Collectively, these findings suggest that individuals with PTSD may preferentially select substances whose pharmacological effects address their predominant symptom burden.

While trauma exposure is nearly universal among individuals seeking treatment for substance use disorders (SUD), the specific associations between distinct post-traumatic stress symptomatology, childhood trauma dimensions, and addiction severity remain poorly delineated in civilian clinical settings. Firstly, many studies focus on narrow outcomes such as daily fluctuations in opioid use (16) or alcohol-related problems (19) instead of a measurement of addiction severity. Secondly, some studies use total PTSD severity scores, which obscure the unique influence of individual symptom clusters (20,21). Additionally, while childhood trauma is a known correlate of addiction, its dimensional impact is rarely analyzed alongside PTSD symptom clusters (22). Lastly, a substantial portion of studies investigating the impact of PTSD symptom clusters, using a dimensional approach, in the SUD population originates from Western military and veteran populations (14,23,24), which limits the

generalizability to civilian populations. The present study addresses these gaps by examining a civilian treatment-seeking SUD population in Hong Kong, utilizing clinician-administered gold-standard instruments (CAPS and Addiction Severity Index) to determine the prevalence of PTSD and trauma within this population. Furthermore, this study would explore and identify the independent PTSD symptoms and childhood trauma subtypes that correlate with alcohol and drug addiction severity outcomes.

METHODS

Participants and setting

This cross-sectional study was conducted from June 2024 to June 2025 at the inpatient and outpatient Substance Abuse Assessment Unit (SAAU) of Kwai Chung Hospital that serves the Kowloon West catchment area, with approximately 1.9 million residents. Participants were recruited from newly referred cases who had engaged in active substance use in the past year and had never received treatment from a substance misuse specialized service. Study participation was voluntary, and written informed consent was obtained. Data were collected through structured, face-to-face interviews conducted by CHY. The study was performed in accordance with the Declaration of Helsinki and was approved by the Hospital Authority Central Institutional Review Board (reference number: CIRB-2024-031-4). This paper is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement (25).

Participants were recruited if they were Chinese, at the age of 18 or above, met the DSM-IV criteria for either substance abuse or dependence, and were currently engaging with a mental health service for SUD. Participants were excluded if they were solely nicotine dependent without other substance use problems, in active intoxication or withdrawal states, unable to understand Chinese, with significant cognitive or communication impairment precluding informed consent, or with comorbidities including organic brain disorders, dementia, delirium, and mood disorders due to general medical conditions.

The required sample size was determined using the standard formula for estimating a population proportion (26). Reported PTSD prevalence among SUD individuals ranged from 23.9% to 42.9% (3–5), and a midpoint estimate of 33.5% was adopted for this calculation, with a 95% confidence interval and a margin of error of 0.08, yielding a minimum required sample of 134 participants. To account for an anticipated 20% non-response rate, the target sample size was set at 168.

Procedures and measures

All eligible patients were invited to provide informed consent and participate in a structured clinical interview conducted by CHY, a psychiatrist with 5 years of clinical experience.

Sociodemographic and clinical data.

Sociodemographic and clinical data were collected via a self-designed questionnaire and medical records. Sociodemographic variables included age, gender, marital status, number of children, living arrangement, education level, employment status, income, and smoking status. Clinical variables comprised history of psychiatric hospitalization and suicide attempt, family history of mental illness or substance abuse, psychiatric comorbidities, and psychiatric medication records.

Lifetime trauma exposure, PTSD diagnosis & symptom severity.

Lifetime trauma exposure and PTSD were assessed with the Chinese version of the Life Event Checklist (LEC) and Clinician-Administered PTSD Scale (CAPS) following the diagnostic criteria of the DSM-IV (27,28). The LEC screens for 17 categories of potentially traumatic events using a 5-point response format (0 = “does not apply” to 4 = “happened to me”). For each item, exposures rated as “happened to you personally,” “witnessed it happen to someone else,” or “learned about it happening to someone close to you” were classified as trauma exposure meeting the DSM-IV Criterion A. To estimate the prevalence of trauma exposure, a binary variable (at least one Criterion A exposure: yes/no) was created, and for correlational analyses, the total count of Criterion A events was treated as a continuous variable. For the CAPS, 17 DSM-IV PTSD symptoms are rated on dual frequency (0–4) and intensity (0–4) scales, and these ratings can be summed to create a severity score for each symptom (0–8). Symptoms with a frequency ≥ 1 and an intensity ≥ 2 were considered clinically significant (29). The binary trauma exposure item and symptom severity cutoff score collectively provided PTSD prevalence estimation. The CAPS is one of the most widely used structured interviews for diagnosing and measuring the severity of PTSD (28). It has been translated and used in a local motor vehicle accident sample study (30). CHY received training in administering the CAPS. Utilizing clinician-administered interviews for PTSD assessment compared to self-report measures can provide a psychologically safe environment for trauma disclosure, reducing potential ascertainment bias due to social desirability or avoidance in this clinical population. At the time of study initiation, the Chinese version of the CAPS for DSM-IV represented the gold-standard, validated clinician-administered instrument available for assessing PTSD in our local clinical setting. Comparison between the CAPS for DSM-IV and DSM-5 showed excellent diagnostic concordance (κ = .84) and strong total severity correlation (r = .83) (31).

Addiction Severity Index (ASI)

The ASI is a widely used semi-structured interview designed to assess the multidimensional severity of SUD across seven domains: medical, employment, alcohol, drug, legal, family/social, and psychiatric functioning (32). Each ASI domain yields a composite score ranging from 0 to 1, with higher composite scores indicating greater problem severity and a higher need for intervention. The Chinese version of the ASI drug and alcohol subscale was shown to have acceptable internal consistency (Cronbach's α = 0.67–0.68) and excellent inter-rater reliability (Cronbach's α = 0.88–0.94) (33). This study only focused on the composite scores for alcohol use and drug use, which reflect substance use severity (22). The ASI is known to have a skewed distribution, and non-parametric tests are recommended (34).

Childhood Trauma Questionnaire-Short Form (CTQ-SF)

Childhood trauma was assessed using the Chinese version of CTQ-SF. The CTQ-SF is a 28-item self-report instrument measuring five dimensions: emotional, physical, and sexual abuse, and emotional and physical neglect. Each item is rated on a 5-point Likert scale (1 = 'never true' to 5 = 'very often true'). For analysis, subscale scores were treated as ordinal variables and categorized into four severity levels, i.e., none/minimal, low-to-moderate, moderate-to-severe, and severe-to-extreme, using established clinical cut-off scores (35). The Chinese version has demonstrated satisfactory psychometric properties in clinical samples, with internal consistency ranging from 0.61 to 0.84 across subscales (36).

Psychiatric Comorbidities

Axis I psychiatric comorbidities were determined with the Chinese-bilingual Structured Clinical Interview for DSM-IV Disorders (SCID-I. The Chinese SCID-I has demonstrated excellent inter-rater reliability (κ = 0.84) and satisfactory test-retest reliability (κ = 0.71) in psychiatric settings in Hong Kong (37). There was no validated Chinese instrument for DSM-5 at study initiation.

Statistical analysis

Sociodemographic, clinical variables, and assessment scores (LEC, CAPS, ASI, and CTQ-SF) were summarised using descriptive statistics. All continuous variables were found to be non-normally distributed using the Shapiro-Wilk test ($p < 0.05$). Multivariable linear regression models were constructed with a two-stage approach to identify the unique associations between PTSD symptom clusters (CAPS) and addiction severity, controlling for sociodemographic factors, clinical variables, and childhood trauma. In the first stage, bivariate analyses, including Spearman's rank correlation, the Mann-Whitney U test, and the Kruskal-Wallis test, were conducted to evaluate relationships between candidate independent variables (e.g., sociodemographic, clinical, and trauma measures) and the outcomes of interest (ASI alcohol and drug composite scores). Variables identified as exceeding a prespecified inclusion threshold ($p < .10$) in the first stage were included in the second stage, where multivariable linear regression models were used to identify factors independently associated with alcohol and drug addiction. Multicollinearity was assessed using variance inflation factors (VIFs), and variables with VIFs below 5 were retained. When overlapping constructs were represented by both total and subscale scores (e.g., CAPS or CTQ), only subscale scores were retained to reduce redundancy and ensure model stability. Variable selection in the final multivariate regression models was performed by backward elimination, retaining variables with $p < 0.05$. As all regression variables were specified a priori, adjustment for multiple comparisons was not applied. All statistical analyses were performed using IBM SPSS Statistics 27.0.

RESULTS

Characteristics of the sample

Of 193 newly referred cases (123 inpatients, 70 outpatients), 160 individuals with DSM-IV SUD were recruited, after 12 failed eligibility, 15 refused, and 6 withdrew (Fig. 1). Participants and non-participants did not differ significantly by age, gender, or admission status (Table S1). The sample was predominantly male (77.5%), secondary-educated (83.1%), never married (40.6%), and living with others (56.3%). Additionally, 79.4% had no children, 37.5% were unemployed, and 49.4% earned less than HK$10,000 per month (Table 1).

Figure 1

STROBE participant recruitment and flow diagram.

Note

There were 193 newly referred cases. Twelve patients were excluded according to pre-defined criteria. Of the 181 eligible patients, 166 provided written informed consent to participate. Six participants subsequently withdrew after declining to complete the study questionnaires, resulting in a final sample of 160 participants.

Table S1.

Comparison of Demographic Characteristics Between Study Participants and Non-participants

Table 1

Sociodemographic Profiles of Participants

Variables	**Total sample, N = 160**
Age, years	43 (37, 49)
Gender	
Male	124 (77.5%)
Female	36 (22.5%)
Admission status	
Inpatient	105 (65.6%)
Outpatient	55 (34.4%)
Marital status	
Never married	65 (40.6%)
Married/Cohabitating	41 (25.6%)
Divorced/Separated	54 (33.8%)
Number of children	
0	127 (79.4%)
1	21 (13.1%)
2 or more	12 (7.5%)
Living arrangement	
Living alone	50 (31.3%)
Living with family/others	90 (56.3%)
In controlled environment	11 (6.9%)
No stable abode	9 (5.6%)
Education level	
Primary	13 (8.1%)
Secondary	133 (83.1%)
Tertiary	14 (8.8%)
Employment status	
Unemployed	73 (45.6%)

Note. Age is reported as Mdn (IQR). All other values represent n (%).

Variables	Total sample, N = 160
Employed	87 (54.4%)
Monthly income	
<HK$10,000	79 (49.4%)
HK$10,000–29,999	54 (33.8%)
≥HK$30,000	27 (16.8%)
Current smoking status	
Yes	118 (73.8%)
No	42 (26.2%)
Note. Age is reported as Mdn (IQR). All other values represent n (%).	

Types and prevalence of substance abuse and dependence

Alcohol use disorder was most prevalent (46.3%), with 38.1% meeting dependence criteria (Table 2). This was followed by sedative/hypnotic/anxiolytic (SHA) disorders (27.5% overall; 22.5% dependence) and opioid use disorders (26.3% overall; 18.8% dependence). Amphetamine use disorders affected 24.4%, primarily driven by abuse (23.1%). Lower overall prevalence rates were observed for cocaine (14.4%), hallucinogens (8.8%), and cannabis (8.1%). Polysubstance dependence was present in 3.8% of the sample.

Table 2

Types and Prevalence of Substance Abuse and Dependence

Substance category	Abuse	Dependence	Any Use Disorder
Alcohol	13 (8.1%)	61 (38.1%)	74 (46.3%)
Sedative, hypnotic, or anxiolytic	8 (5.0%)	36 (22.5%)	44 (27.5%)
Opioid	12 (7.5%)	30 (18.8%)	42 (26.3%)
Amphemtamine	37 (23.1%)	2 (1.3%)	39 (24.4%)
Cocaine	21 (13.1%)	2 (1.3%)	23 (14.4%)
Hallucinogen	5 (3.1%)	9 (5.6%)	14 (8.8%)
Cannabis	13 (8.1%)	0	13 (8.1%)
Polysubstance dependence	-	6 (3.8%)	6 (3.8%)
Note. Values represent n (%) based on the total sample (N = 160). Percentages exceed 100% because participants may report more than one substance category. “Any Use Disorder” includes participants meeting criteria for either abuse or dependence, per substance category.			

Trauma, PTSD, and other psychiatric comorbidities

Lifetime trauma exposure (LEC) was reported by 80.0%, and 39.4% met lifetime PTSD criteria (CAPS; Table S2). Median CAPS scores were 16 total, 4 for re-experiencing, 0 for avoidance/numbing, and 2 for arousal. On the CTQ, physical neglect was most frequent (94.4%) and sexual abuse least frequent (23.1%; Table S3). Clinical history revealed high severity and healthcare utilization, with 65.6% having prior psychiatric hospitalizations, 80.6% held psychotropic prescriptions, 44.4% had attempted suicide, and 48.1% presented with a non-SUD psychiatric comorbidity (Table S4).

Table S2

Lifetime Trauma Exposure Profiles and PTSD Symptom Severity Among Participants

Table S3

Prevalence of Childhood Trauma by CTQ Severity Category

Table S4

Clinical Characteristics and Psychiatric Comorbidities

Correlates of alcohol-specific addiction severity

Bivariate screening yielded 19 candidate variables ($p < .10$; Table S5). The final multivariable model was significant, explaining 52% of the variance in alcohol severity ($R^2_{adj} = .52$, $F(11, 148) = 15.93$, $p < .001$; Table 3). Lifetime PTSD diagnosis ($B = 2.74$, 95% *CI* [1.54, 3.95], $p < .001$), CAPS re-experiencing severity ($B = 0.18$, 95% *CI* [0.11, 0.25], $p < .001$), and CAPS avoidance/numbing severity ($B = 0.33$, 95% *CI* [0.24, 0.42], $p < .001$) emerged as highly significant independent positive correlates. Higher alcohol severity was also independently predicted by living alone, a family history of substance misuse, comorbid mood disorders, a history of suicide attempts, and childhood trauma subscales (emotional neglect and sexual abuse), with all individual 95% confidence intervals excluding zero (all $p < .05$; see Table 3). Conversely, residing in a controlled environment ($B = -5.07$, 95% *CI* [−6.74, − 3.39], $p < .001$) and a history of being prescribed psychiatric medication ($B = -2.36$, 95% *CI* [−3.33, − 1.39], $p < .001$) independently predicted lower alcohol severity.

Table S5

Variables Showing p < .10 in Bivariate Analyses with ASI Drug Composite Score

Table 3

Multiple Linear Regression Analysis for ASI Alcohol Composite Score

Variables	*B*	*SE B*	95% CI	*p*-value	*T*-value
Sociodemographic Factors					
Living alone	1.67	0.43	[0.81, 2.53]	< .001***	3.84
Living in controlled environment	-5.07	0.85	[-6.74, -3.39]	< .001***	-5.99
Clinical Factors					
History of suicide attempt	1.26	0.44	[0.38, 2.13]	.005**	2.85
Family history of substance misuse	4.97	0.48	[4.02, 5.91]	< .001***	10.4
History of being prescribed psychiatric medication	-2.36	0.49	[-3.33, -1.39]	< .001***	-4.81
Mood Disorders	1.63	0.42	[0.79, 2.47]	< .001***	3.84
PTSD Diagnosis and CAPS Scores					
Lifetime PTSD diagnosis	2.74	0.61	[1.54, 3.95]	< .001***	4.51
CAPS Reexperiencing score	0.18	0.03	[0.11, 0.25]	< .001***	5.29
CAPS Avoidance/Numbing score	0.33	0.04	[0.24, 0.42]	< .001***	7.45
CTQ Scores					
CTQ Emotional Neglect	0.23	0.05	[0.14, 0.32]	< .001***	4.94
CTQ Sexual Abuse	0.37	0.07	[0.23, 0.50]	< .001***	5.27

Note. This table presents the final model resulting from a backward regression analysis. Non-significant predictors from the initial model are not shown. R^2 = .55, Adjusted R^2 = .52, F (11, 148) = 15.93, p < .001. B = unstandardized coefficient; SE B = standard error; CI = confidence interval.

*p < .05. **p < .01. ***p < .001.

Correlates of substance-specific addiction severity

Bivariate analyses identified 17 candidate variables ($p < .10$; Table S5). The final regression model explained 65% of the variance in drug severity ($R^2_{adj} = .65$, $F(9, 150) = 15.98$, $p < .001$; Table 4). Lifetime

PTSD diagnosis (*B* = 0.11, 95% *CI* [0.06, 0.16], *p* < .001) and CAPS avoidance/numbing severity (*B* = 0.004, 95% *CI* [0.002, 0.005], *p* < .001) emerged as highly significant independent positive correlates. Drug severity was also independently predicted by older age, family history of mental illness, psychiatric medication history, substance-induced psychotic disorder, and childhood trauma subscales (emotional neglect and sexual abuse), with all individual 95% confidence intervals excluding zero (all *p* < .05; see Table 4). Conversely, living with family or others was protective against higher drug severity (*B* = -0.10, 95% *CI* [–0.14, – 0.06], *p* < .001).

Table 4

Multiple Linear Regression Analysis for ASI Drug Composite Score

Variables	***B***	***SE B***	**95% CI**	***p*-value**	***T*-value**
Sociodemographic Factors					
Age	0.003	7.77×10^{-4}	[0.001, 0.004]	< .001***	3.47
Living with family/others	-0.10	0.02	[-0.14, -0.06]	< .001***	-5.22
Clinical Factors					
Family history of mental illness	0.03	0.02	[6.59×10^{-4}, 0.07]	.046*	2.02
History of being prescribed psychiatric medication	0.08	0.03	[0.03, 0.13]	.002**	3.14
Substance-induced psychotic disorder	0.04	0.02	[0.003, 0.07]	.031*	2.18
PTSD Diagnosis and CAPS Scores					
Lifetime PTSD diagnosis	0.11	0.03	[0.06, 0.16]	< .001***	4.51
CAPS Avoidance/Numbing score	0.004	6.72×10^{-4}	[0.002, 0.005]	< .001***	5.28
CTQ Scores					
CTQ Sexual Abuse	0.01	0.003	[0.005, 0.015]	< .001***	3.83
CTQ Emotional Neglect	0.004	0.002	[9.71×10^{-4}, 0.01]	.011*	2.58

Note. This table presents the final model resulting from a backward regression analysis. Non-significant predictors from the initial model are not shown. R^2 = .70, Adjusted R^2 = .65, F (9, 150) = 15.98, p < .001. B = unstandardized coefficient; SE B = standard error; CI = confidence interval; CTQ = Childhood Trauma Questionnaire; PTSD = Posttraumatic Stress Disorder; CAPS = Clinician-Administered PTSD Scale. B, SE B, and CI are reported to two decimal places except where greater precision is necessary to distinguish small values.

*p < .05. **p < .01. ***p < .001.

DISCUSSION

This study examined the relationships between PTSD symptom clusters and addiction severity among treatment-seeking adults with SUD. Our results showed a high prevalence of trauma exposure (80%) and lifetime PTSD (39.4%), alongside significant clinical severity, psychiatric comorbidity, and high healthcare utilization. Importantly, lifetime PTSD was an independent correlate of both alcohol and drug severity. Within PTSD symptomatology, re-experiencing was tied to alcohol severity, whereas avoidance/numbing independently correlated with both alcohol and drug addiction severity.

The high rates of trauma (80%) and PTSD (39.4%) in this cohort are substantially higher than those of the general Hong Kong population (64.8% trauma, 0.9% PTSD) and global populations (70.3% trauma, 4.0% PTSD). (38,39). This disparity underscores the heightened vulnerability of individuals with SUD to maladaptive trauma responses. As the first regional study on trauma and PTSD within SUD treatment populations, our findings are consistent with international data showing 75.4%–100% trauma exposure and 23.9%–42.9% PTSD rates in treatment-seeking SUD samples (3–5). These figures underscore that trauma and PTSD are normative rather than exceptional features in this population, reinforcing the need for trauma-informed care within local addiction services.

This study demonstrates that both a lifetime PTSD diagnosis and dimensional PTSD symptom severity were independently associated with greater addiction severity across alcohol and drug domains, beyond sociodemographic factors, clinical variables, and childhood trauma. In contrast, exposure to traumatic events alone, meeting DSM Criterion A, in the absence of PTSD, was not found to be an independent correlate of addiction severity. This distinction is consistent with previous research suggesting that the psychopathology of PTSD may largely account for the relationship between trauma and addiction severity (40,41).

Within PTSD symptomatology, the severity of avoidance and numbing symptoms independently correlates with increased alcohol and drug addiction severity in this study. These findings could be understood with the self-medication model, where substance use serves to regulate negative emotional states (12,42,43). Consistent with our finding, avoidance/ numbing symptoms were most frequently found to be associated with alcohol misuse in previous studies (12). In contrast, hyperarousal symptoms have been more consistently implicated in drug misuse within Western clinical samples (13,14,16). Our findings highlight a distinct focus on the avoidance and numbing symptoms cluster for both drug and alcohol addiction severity. This discrepancy likely reflects the local, unique regional drug misuse patterns, with high prevalence of sedative and opioid use, which suppresses amygdala hyperactivity and dampens noradrenergic arousal (44,45). Within the self-medication framework, these substances are utilized to establish a chemical barrier against the distressing affective states associated with the traumatic event.

The association between re-experiencing and alcohol addiction severity is interpretable through a neurobiologically grounded, mutually maintaining model. Intrusive reexperiencing symptoms are understood as conditioned responses to trauma cues, where extinction learning serves to weaken these

intrusions (46). Preclinical models demonstrate that chronic ethanol exposure impairs fear extinction (47) by blocking NMDA receptors on medial prefrontal cortical (mPFC) neurons (48), an effect that is reversible by enhancing infralimbic glutamatergic activity (49). Acute alcohol administration similarly impairs extinction learning in healthy humans (50). Chronic alcohol misuse may further impair extinction learning indirectly through disruption of REM sleep architecture (51,52) and withdrawal-induced amygdala sensitization (53). These fear extinction-interfering mechanisms of alcohol extend the self-medication theory into a mutually maintaining model through a proposed bidirectional relationship between alcohol use and PTSD symptoms (54). Our finding that re-experiencing severity was uniquely and independently associated with alcohol severity, whereas it did not emerge as a significant correlate in the final multivariable model for drug severity, provides clinical evidence supporting these substance- and symptom-specific relationships in a real-world setting. Further longitudinal study will elucidate the temporal relationship between the PTSD symptoms and specific drug addiction severity. In particular, future research could study the process of fear extinction in patients with alcohol use disorder, which may inform the development of targeted treatment strategies, such as the use of glutamatergic medications, e.g., D-cycloserine (55). Conversely, the lack of association between re-experiencing and drug severity should be interpreted cautiously due to the pharmacological heterogeneity of the aggregated ASI drug score.

Within various forms of childhood trauma, emotional neglect and sexual abuse emerged as independent correlates of addiction severity across both alcohol and drug domains in this study. Previous meta-analytic data have suggested that sexual abuse, but not emotional neglect, increases the risk of developing substance use disorder (56). However, research within SUD clinical samples revealed more nuances, showing no association between having a history of childhood sexual abuse and drug addiction severity, and mixed findings for the association with alcohol addiction severity (57,58). Similarly, while emotional neglect has been linked to increased severity of substance misuse in general populations (59,60), a prior study in the SUD clinical sample failed to demonstrate this link (22). Given the high prevalence of childhood trauma in the SUD population, previous studies that treated trauma exposure as a binary variable may leave studies underpowered. By adopting a dimensional approach to trauma severity, our findings extended the literature by demonstrating that both childhood sexual abuse and emotional neglect independently drive the severity of current drug or alcohol addiction in the SUD clinical population.

Given the high rates of PTSD and childhood trauma among individuals with SUD in this sample, trauma-informed care (TIC) is recommended for SUD treatment services (61,62). TIC is an organizational and clinical framework that ensures all aspects of care are sensitive to the widespread impact of trauma, prioritizing psychological safety, trust, and client empowerment to avoid re-traumatization (63). Importantly, working in a trauma-informed way does not require routine trauma disclosure. The primary emphasis is on trauma education and creating conditions of safety that support patient engagement with substance use treatment. Adopting TIC in SUD treatment settings may result in a reduction in substance use or mental health and trauma symptoms and an increase in treatment retention (62,64). Furthermore, given the high prevalence of PTSD in this population and its association with addiction

severity, SUD treatment services should be prepared to provide evidence-based psychological interventions targeting PTSD when patients are clinically stable and ready to engage. Existing meta-analytic evidence suggests that trauma-focused integrated interventions yield modest benefits for PTSD outcomes in comorbid SUD populations, though dropout rates are high, and benefits for substance use outcomes beyond standard addiction treatment remain limited (8). Further investigation into the pharmacological effects of illicit substances on the neurobiology of PTSD is required to delineate their perpetuating relationships further and develop targeted treatment.

This study benefits from several strengths, including consecutive sampling across inpatient and outpatient settings, high engagement (88.4%), and clinician-administered CAPS interviews. However, several limitations remain. First, the cross-sectional design precludes definitive causal or temporal inferences regarding the relationships between trauma exposure, PTSD symptom clusters, and addiction severity. Second, psychiatric comorbidities and PTSD were evaluated using SCID-I and CAPS based on DSM-IV criteria, as fully validated Chinese DSM-5 clinician-administered instruments were unavailable in the local clinical infrastructure at study initiation. Third, because the CAPS for DSM-IV combines active behavioral avoidance and emotional numbing into a single Criterion C subscale, we were unable to delineate the relative independent contributions of behavioral avoidance versus cognitive-affective numbing to specific substance use profiles. Future prospective studies employing DSM-5 or ICD-11 frameworks are needed to clarify these distinct psychopathological dimensions. Fourth, measures of childhood trauma and substance use history were retrospective and subject to recall bias. Furthermore, the aggregated ASI drug composite score may obscure substance-specific associations across distinct pharmacological profiles. Moreover, despite adjusting for multiple covariates, unmeasured confounders such as genetic resilience or ongoing stressors could still affect these associations. Finally, the findings are specific to treatment-seeking individuals and may not generalize to non-treatment-seeking populations or those managed exclusively in community-based primary care.

CONCLUSIONS

In conclusion, trauma and PTSD are highly prevalent and independently tied to increased addiction severity among treatment-seeking individuals with SUD in Hong Kong. These findings highlight the need for implementing trauma-informed organizational frameworks, integrating PTSD treatment within regional addiction services, and prospective research to map the causal trajectories of these complex comorbidities.

Abbreviations

ASI
Addiction Severity Index
CAPS
Clinician-Administered PTSD Scale
CI

Confidence Interval
CTQ / CTQ-SF
Childhood Trauma Questionnaire / Childhood Trauma Questionnaire-Short form
DSM-IV / DSM-5
Diagnostic and Statistical Manual of Mental Disorders, 4th/5th Edition
HK$
Hong Kong Dollar
ICD-11
International Classification of Diseases, 11th Revision
LEC
Life Event Checklist
mPFC
Medial Prefrontal Cortex
NMDA
N-Methyl-D-Aspartate (receptor)
PTSD
Post-Traumatic Stress Disorder
REM
Rapid Eye Movement (sleep)
SAAU
Substance Abuse Assessment Unit
SCID-I
Structured Clinical Interview for DSM-IV Disorders
SHA
Sedative/Hypnotic/Anxiolytic
STROBE
Strengthening the Reporting of Observational Studies in Epidemiology
SUD(s)
Substance Use Disorder(s)
TIC
Trauma-Informed Care
VIF(s)
Variance Inflation Factor(s)

Declarations

Ethics approval and consent to participate

The study was performed in accordance with the Declaration of Helsinki and was approved by the Hospital Authority Central Institutional Review Board (reference number: CIRB-2024-031-4).

Consent for publication

NA

Competing interests

The authors declare no competing interests regarding the publication of this manuscript.

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Author Contribution

Conceptualization: BC, WWL, BMMC, FY; Data curation: BC; Formal analysis: BC; Investigation: BC; Methodology: BC, ETHL; Project administration: BC; Resources: BMMC, WWL, KSC, KMC; Supervision: BMMC, WWL, KSC, KMC, ETHL; Visualization: BC, ETHL; Writing – original draft: BC, ETHL; Writing – review & editing: BC, ETHL, FY, KFC. All authors read and approved the final manuscript.

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Data Availability Statement

The datasets generated and/or analysed during the current study are not publicly available as the participants of this study did not give written consent for their data to be shared publicly.

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Figures

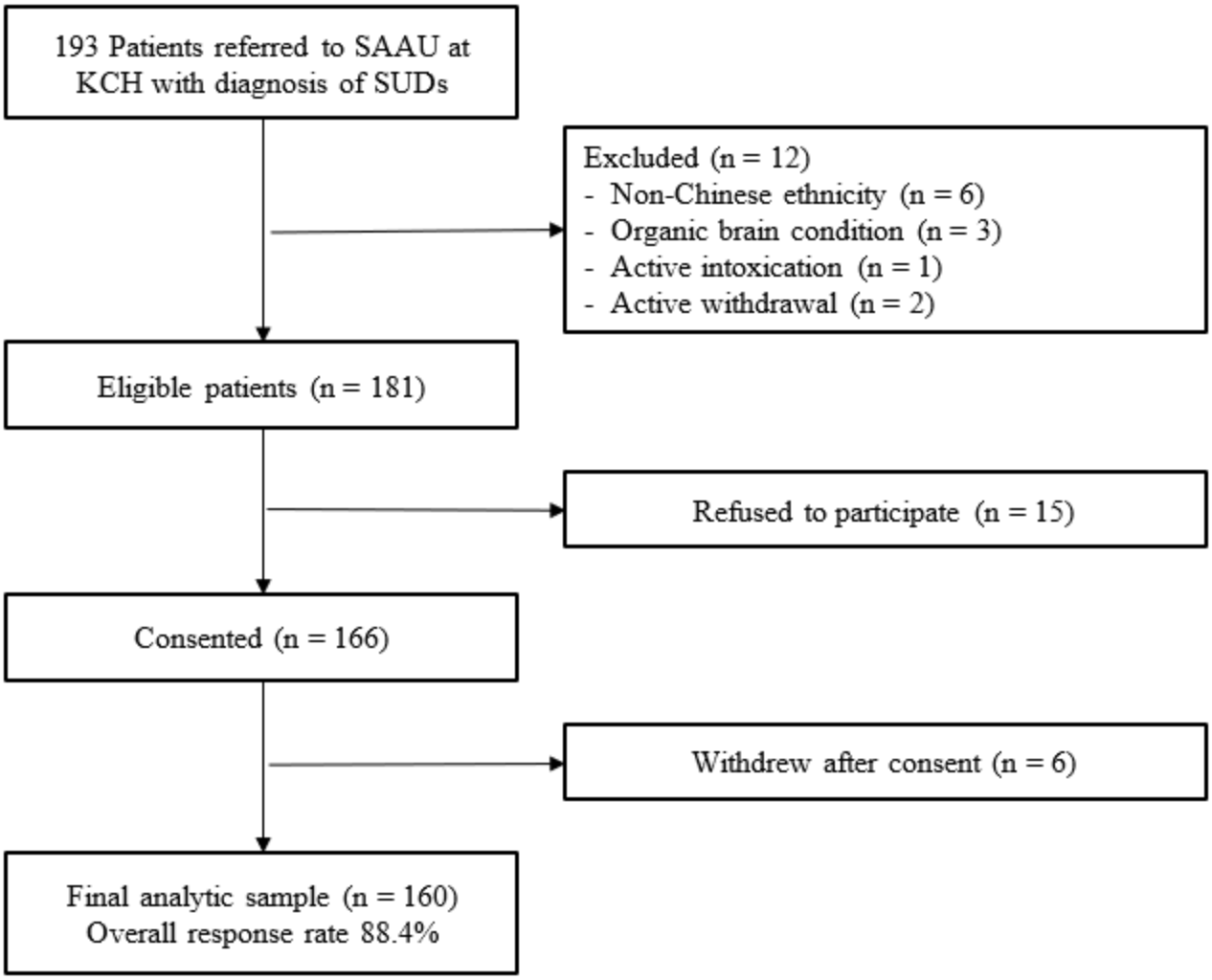


Figure 1

STROBE participant recruitment and flow diagram.

Note. There were 193 newly referred cases. Twelve patients were excluded according to pre-defined criteria. Of the 181 eligible patients, 166 provided written informed consent to participate. Six

participants subsequently withdrew after declining to complete the study questionnaires, resulting in a final sample of 160 participants.

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