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Risk Factors of Alcohol Use Disorders Among Inpatients with Schizophrenia: An Institutional-Based Cross-sectional Survey

ABSTRACT

Objective: This study aimed to elucidate the risk factors associated with alcohol use disorders (AUDs) among inpatients with schizophrenia at a specialized mental hospital in Baoding city, China.

Methods: This cross-sectional survey comprised 301 comorbid patients. Three binary logistic regression models were used to investigate the factors linked to AUDs in patients with schizophrenia. Propensity score matching analysis was conducted to validate inconsistent variables identified by the regression models.

Results: Significant differences were observed between the comorbid and non-comorbid groups concerning sex ($P < .001$), disposition ($P = .049$), smoking habits ($P < .001$), place of residence ($P = .010$), family relationships ($P = .002$), family history of mental disorders ($P = .008$), history of alcoholism ($P = .003$), onset latency ($P = .005$), impulsivity ($P < .001$), suicide or self-injury history ($P < .001$), and obvious aggressive behavior ($P < .001$) in univariate analyses. The area under the curve values for the three regression models were 0.83 ($P < .001$), 0.80 ($P < .001$), and 0.81 ($P < .001$), respectively. Binary logistic regression and propensity score matching analyses indicated that introverted disposition, smoking, acute onset, impulsivity, and suicide or self-injury history were independent risk factors associated with AUDs in inpatients with schizophrenia with an odds ratio of > 1.

Conclusion: Introverted disposition, smoking, acute onset, impulsivity, and suicide or self-injury history were independently associated with the AUDs in inpatients with schizophrenia. Future studies should prioritize longitudinal studies to discern the evolving dynamics of potential confounding risk factors.

Keywords: Alcohol use disorders, binary logistic regression, propensity score matching, risk factors, schizophrenia

Introduction

Schizophrenia remains one of the most misinterpreted, neglected, and stigmatized medical conditions globally.[1] Alcohol use disorders (AUDs) are chronic and recurrent conditions, contributing to around 4% of the global burden of disease.[2] According to the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (*DSM-5*) criteria, the prevalence rates of 12-month and lifetime AUD are reported to be 13.9% and 29.1%, respectively.[3] Continual alcohol or substance abuse exacerbates the overall progression of schizophrenia, leading to heightened rates of morbidity and mortality.[4]

Patients with schizophrenia and comorbid AUDs often exhibit greater severity of psychopathology and neurocognitive impairment.[5,6] Given the detrimental impact of AUDs on treatment adherence, medication efficacy, and hospitalization rates, there is an urgent need for identifying and assessing comorbid AUDs in patients with psychiatric conditions.[7,8] However, the majority of individuals in low and middle-income countries suffering from severe psychiatric disorders, including dual diagnoses, are not provided adequate treatment for their

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mental illness.[9] Thus, early detection of AUDs can prevent various complications and provide an opportunity for intervention through integrated treatment for patients with dual diagnoses.

Several predictors of comorbid AUDs in patients with schizophrenia, including male sex, severity of negative symptoms and depression,[10] level of education, history of violent behavior, family history of substance use disorders,[11] marital status, duration of illness, previous psychiatric diagnoses, and concurrent use of non-alcoholic substances have been shown.[12] Discrepancies in findings across studies may be attributed to variations in social and cultural norms. Despite the prevalence of both traditional and modern alcoholic beverages in China, there is a significant gap in comprehensive study on the prevalence of AUD among patients with schizophrenia.

This study aims to investigate the factors associated with AUD in this population using propensity score matching (PSM) and logistic regression analysis. In the context of precision medicine, timely recognition of comorbidity risk factors is advantageous for healthcare providers in effectively screening patients with AUD and establishing a foundation subsequently for psychological counseling interventions. We hypothesize that the factors contributing to AUD among patients with schizophrenia receiving treatment at a specialized mental hospital in Baoding city, China, may differ from those observed in other countries due to variations in geographic location and sociocultural contexts.

Material and Methods

Participants

The sample size was determined using the single population proportion formula with a 95% confidence interval (CI), 2-sided interval, 4.8% allowable error, and an estimated proportion of 24.3% for AUD, according to a previous meta-analysis.[13] The final estimated sample size was 307. Systematic random sampling was used, with every other patient included in the study following the random selection of the initial participant.

Between October 2017 and February 2018, this cross-sectional survey was conducted at the Hebei Provincial Mental Health Center in Baoding city, China. Inpatients diagnosed with schizophrenia according to the *DSM-5* criteria, aged 18 years and above, were included. Patients who were deemed severely ill and unable to provide the necessary information were excluded. The study received ethical approval from the Ethics Committee of Hebei Provincial Mental Health Center (number: 201603+), and participants provided informed consent before the survey commenced. This study adhered to the principles outlined in the Helsinki Declaration.

MAIN POINTS

- *The prevalence of alcohol use disorder (AUD) was 19.8% among inpatients with schizophrenia, lower than 24.3% in a previous meta-analysis.*
- *Introverted disposition, smoking, acute onset, impulsivity, and suicide or self-injury history were independently associated with the AUDs in inpatients with schizophrenia.*
- *The combination of binary logistic regression analysis and propensity score matching analyses may help to screen risk variables better.*

Clinical Interview and Assessments

Two attending physicians conducted face-to-face interviews for all evaluations. A self-reported questionnaire was created specifically for this study to gather demographic and clinical information from patients, including age, sex, marital status, education level, occupation, smoking habits, place of residence, family relationships, family history of mental illness and alcoholism, onset latency, onset age, and a history of impulsivity, suicide attempts, or self-harm. Acute onset is defined as a timeframe of < 2 weeks from the initial suspicion of mental disorders to the manifestation of overt symptoms in patients. Subacute onset, conversely, spans a period of 2 weeks to 3 months from the onset of suspected mental disorders to the emergence of clinically significant symptoms. Chronic onset, conversely, denotes a duration exceeding 3 months between the initial suspicion of mental disorders and the clear manifestation of symptoms. Data collectors and supervisors underwent a comprehensive 2-day training session encompassing the study's objectives, questionnaire specifics, interviewing methodologies, privacy protocols, and the safeguarding of patient confidentiality.

The classification of AUD was determined as per the DSM-5 criteria and confirmed by 2 or more attending psychiatrists. Aggressive behaviors exhibited within the previous week were assessed using the Chinese adaptation of the Modified Overt Aggression Scale (MOAS),[14] which comprises four subscales, with each form of aggression assessed on a scale of 0–4, where 0 signifies the absence of aggression and higher scores denote higher levels of aggression. Then, the score for each subscale is multiplied by a predetermined weight (1 for verbal aggression, 2 for aggression toward objects, 3 for self-directed aggression, and 4 for aggression toward others), providing the total weighted score for each subscale. Patients were categorized as exhibiting aggressive behavior if their total score exceeded 4.[15] A prior survey study substantiated that the Chinese version of the MOAS exhibits moderate psychometric characteristics, as evidenced by an intra-class correlation coefficient of 0.94 and Kendall's W coefficient of concordance of 0.83.[14]

Statistical Analysis

The statistical analyses were performed utilizing Statistical Package for the Social Sciences version 24.0 (IBM SPSS Corp.; Armonk, NY, USA), with a significance level set at $P < .050$. Descriptive statistics were presented as median (minimum–maximum) for non-normally distributed variables and mean ± standard deviation (SD) for normally distributed variables. Categorical variables were displayed as frequencies and percentages. The Mann–Whitney *U*-test was employed to compare the differences in age and age at onset between the AUD group and non-AUD groups, while Fisher–Freeman–Halton tests were utilized for categorical variables.

Binary logistic regression with Omnibus' test was used to identify independent variables associated with comorbid alcohol use disorder in patients with schizophrenia. To enhance prediction accuracy, three common regression models were utilized: univariate, enter, and stepwise filtering (Forward Conditional).[16-18] Dummy variables were created for unordered multiclass variables such as marital status in the regression models. Odds ratios and their corresponding 95% CIs were calculated to assess the suitability of the condition in the regression equation. An odds ratio of > 1 indicated a risk factor and that of < 1 indicated a protective factor. Furthermore, the receiver operating characteristic curve (ROC) was utilized to assess the discriminatory ability of the regression model.

Comorbid AUD-related independent variables of uncertain significance from the three regression models were validated through PSM analysis, which minimizes selection bias in retrospective studies and approximates the effects of a randomized controlled trial.[19] Based on the estimated PSM scores, the matched analysis was conducted at a ratio of 1 : 2 using the closest-neighbor matching method with a match tolerance of 0.03.[20] Equilibrium tests were conducted on the matched variables between the 2 groups. A 2-sided test with a significance level of $P < .05$ was used to determine statistical significance.

Results

Sociodemographic and Clinical Characteristics

A total of 307 psychiatric inpatients were initially approached, of which 301 consented to participate, yielding a response rate of 98.1%. Among them, 59 were classified in the AUD group, while 242 were in the non-AUD group, resulting in a prevalence of AUD of 19.6% (Table 1). Significant differences were noted between the 2 groups concerning sex [female: 13 (22.03%) and 135 (55.79%), $P < .001$], disposition [introverted: 51 (86.44%) and 177 (73.14%), $P = .049$], smoking habits [38 (64.41%) and 59 (24.38%), $P < .001$], place of residence [with parents: 39 (66.10%) and 101 (41.74%), $P = .010$], family relationships [harmony: 26 (44.07%) and 95 (39.26%), $P = .002$], family history of mental disorders [26 (44.07%) and 62 (25.62%), $P = .008$], history of alcoholism [14 (23.73%) and 21 (8.68%), $P = .003$], onset latency [Acute/subacute: 21 (35.59%) and 42 (17.77%), $P = .005$], impulsivity [37 (62.71%) and 72 (29.75%), $P < .001$], suicide or self-injury history [16 (27.12%) and 23 (9.50%), $P < .001$], and obvious aggressive behavior [36 (61.02%) and 80 (33.06%), $P < .001$] (Table 1). However, no significant differences were observed in age, age at onset, marital

Table 1. Characteristics of Included Inpatients with Schizophrenia

		Comorbid AUD		
Variables	**Overall (n = 301)**	**With AUD (n = 59)**	**Without AUD (n = 242)**	***P***
Age (years)	36.00 [27.00, 47.00]	36.00 [28.00, 46.00]	36.50 [27.00, 49.00]	.610
Age at onset (years)	24.00 [20.00, 31.00]	24.00 [22.00, 26.00]	24.00 [20.00, 32.00]	.894
Sex (female)	148 (49.17%)	13 (22.03%)	135 (55.79%)	< .001*
Marital status				.115
Unmarried	100 (33.22%)	21 (35.59%)	79 (32.64%)	
Married	142 (47.18%)	33 (55.93%)	109 (45.04%)	
Divorced	45 (14.95%)	4 (6.78%)	41 (16.94%)	
Others	14 (4.65%)	1 (1.69%)	13 (5.37%)	
Education				.817
Primary school or below	55 (18.27%)	12 (20.34%)	43 (17.77%)	
Junior high school	132 (43.85%)	27 (45.76%)	105 (43.39%)	
Senior high school	81 (26.91%)	13 (22.03%)	68 (28.10%)	
College degree or above	33 (10.96%)	7 (11.86%)	26 (10.74%)	
Disposition				.049*
Extroverted	73 (24.25%)	8 (13.56%)	65 (26.86%)	
Introverted	228 (75.75%)	51 (86.44%)	177 (73.14%)	
Smoking	97 (32.23%)	38 (64.41%)	59 (24.38%)	.001*
Residence				.010*
With parents	140 (46.51%)	39 (66.10%)	101 (41.74%)	
With spouse	119 (39.53%)	15 (25.42%)	104 (42.98%)	
Alone	21 (6.98%)	3 (5.08%)	18 (7.44%)	
Others	21 (6.98%)	2 (3.39%)	19 (7.85%)	
Family relationships				.002*
Harmony	121 (40.20%)	26 (44.07%)	95 (39.26%)	
Average	118 (39.20%)	13 (22.03%)	105 (43.39%)	
Inharmony	62 (20.60%)	20 (33.90%)	42 (17.36%)	
Family history of mental disorders	88 (29.24%)	26 (44.07%)	62 (25.62%)	.008*
History of alcoholism	35 (11.63%)	14 (23.73%)	21 (8.68%)	.003*
Onset latency				.005*
Acute/subacute	64 (21.26%)	21 (35.59%)	42 (17.77%)	
Chronic	237 (78.74%)	38 (64.41%)	199 (82.23%)	
Impulsivity	109 (36.21%)	37 (62.71%)	72 (29.75%)	<.001*
Suicide or self-injury history	39 (12.96%)	16 (27.12%)	23 (9.50%)	<.001*
Obvious aggressive behavior (MOAS)	116 (38.54%)	36 (61.02%)	80 (33.06%)	<.001*
Chronic	237 (78.74%)	38 (64.41%)	199 (82.23%)	

The comparisons between age and age at onset of the 2 groups was conducted using the Mann–Whitney *U*-test, while the comparisons of rest variables was performed by the Fisher–Freeman–Halton test.
AUD, alcohol use disorder; MOAS, Chinese adaptation of the Modified Overt Aggression Scale.
*Denotes statistically significant *P*-values.

status, and education between the 2 groups ($P > .050$ for each), as shown in Table 1.

Binary Logistic Regression Analysis

To explore the independent variables associated with comorbid AUD in patients with schizophrenia, binary logistic regression, adjusted for confounders, was employed (Table 2). The results of the Omnibus test indicated that the *P*-values for all three regression models were below 0.001, suggesting good model fitness. Model 1 suggests that comorbid AUD is associated with disposition (odds ratio [OR] = 3.91, 95% CI: 1.41-10.84, $P = .009$), smoking (OR = 3.70, 95% CI: 1.48-9.25, $P = .005$), impulsivity (OR = 2.91, 95% CI: 1.11-7.60, $P = .029$), suicide or self-injury history (OR = 4.95, 95% CI: 1.83-13.42, $P = .002$). In model 2, onset latency (OR = 0.40, 95% CI: 0.19-0.84, $P = .016$), dispositions (OR = 2.97, 95% CI: 1.20-7.31, $P = .018$), smoking (OR = 5.49, 95% CI: 2.83-10.66, $P < .001$), impulsivity (OR = 2.91, 95% CI: 1.50-5.65, $P = .002$), and suicide or self-injury history (OR = 3.81, 95% CI: 1.62-8.97, $P = .002$) were included as independent variables. Model 3 integrated the same critical independent variables as model 2 in the regression equation. ROC analysis indicated that the area under the curve values for the three regression models were 0.83 (standard error (SE) = 0.035, $P < .001$), 0.80 (SE = 0.036, $P < .001$), and 0.81 (SE = 0.035, $P < .001$), respectively, suggesting comparable predictive capabilities across the models (Figure 1).

Propensity Score Matching Analysis

Analysis in Table 2 reveals that disposition, smoking, impulsivity, suicide, and self-injury history were consistent across all three regression models, denoted as model 1. Notably, models 2 and 3 introduced an additional independent variable, onset latency, into the regression equation. To further unravel the association between onset latency and comorbid AUD, the 301 cases were categorized into 2 groups based on their onset latency (64 cases with acute/subacute onset latency and 237 cases with chronic onset latency). Predictive variables considered in the PSM analysis included age, age at onset, marital status, education, sex, disposition, smoking habits, residence, family relationships, presence of mental disorders, alcoholism, impulsivity, suicide or self-injury history, and aggressive behavior. A match tolerance of 0.003 was determined for the analysis. The predictive variables were appropriately balanced through PSM between the acute/subacute and chronic onset latency groups. Following a 1 : 2 matching process, which led to some cases in the chronic group being matched with more than 1 case in the acute/subacute group, and 1 case in the acute/subacute group not finding a match, a total of 63 and 86 patients were included in the acute/subacute and chronic onset latency groups, respectively (Table 3). Furthermore, onset latency continued to be a significant factor in independently predicting the risk of comorbid AUD in patients with schizophrenia ($P = .043$).

Discussion

In this institutional-based cross-sectional study conducted in Baoding city, China, we aimed to investigate the risk factors associated with AUD among inpatients with schizophrenia using binary logistic regression and PSM analyses. Our findings revealed that introverted disposition, smoking, acute onset, impulsivity, and suicide or self-injury history were significantly associated with AUD. Furthermore, each regression model demonstrated a good predictive power for identifying AUD among patients with schizophrenia.

This study unveiled a SUD prevalence rate of 19.6% among inpatients diagnosed with schizophrenia, closely aligning with findings from a prior meta-analysis (24.3%).[13] It is noteworthy to acknowledge the significant variability in comorbidity rates across different countries, as evidenced by rates in Ethiopia (38.4%),[12] South Africa (41.2%),[21] and Australia (38.0%).[22] Cultural factors and variations in diagnostic tools may contribute to these discrepancies. While previous studies utilized screening scales such as the Alcohol Use Disorders Identification Test for determining AUD, our study employed structured interviews guided by the *DSM-5*. Furthermore, the observed prevalence of comorbidities in our study surpassed that reported in community-based studies from Singapore (3.6%),[23] which may be attributed to the psychiatric hospital setting of our study.

Patients with AUD often exhibit personality traits such as sensation seeking, impulsivity, hopelessness, and anxiety sensitivity.[24-26] Sensation seeking, specifically characterized by a low tolerance for boredom and a strong desire for stimulation, is commonly observed

Table 2. Risk Factors Associated with Comorbid AUD in Patients with Schizophrenia

Methods	Independent variable	Wald's χ^2	OR	95% CI	*P*
Model 1	Disposition (ref.: extroverted)	6.875	3.911	1.411-10.842	.009
	Smoking (ref.: none)	7.844	3.703	1.481-9.254	.005
	Impulsivity (ref.: none)	4.738	2.907	1.112-7.598	.029
	Suicide or self-injury history (ref.: none)	9.907	4.953	1.829-13.416	.002
Model 2	Onset latency (ref.: acute/subacute)	5.842	0.404	0.194-0.843	.016
	Disposition (ref.: extroverted)	5.578	2.966	1.203-7.314	.018
	Smoking (ref.: none)	25.302	5.489	2.827-10.657	< .001
	Impulsivity (ref.: none)	9.979	2.912	1.500-5.653	.002
	Suicide or self-injury history (ref.: none)	9.379	3.811	1.619-8.974	.002
Model 3	Onset latency (ref.: acute/subacute)	4.780	0.422	0.195-0.914	.029
	Disposition (ref.: extroverted)	5.880	3.301	1.257-8.667	.015
	Smoking (ref.: none)	11.077	4.082	1.783-9.344	.001
	Impulsivity (ref.: none)	5.574	2.867	1.196-6.873	.018
	Suicide or self-injury history (ref.: none)	9.904	4.494	1.763-11.456	.002

Model 1: enter; model 2: stepwise; model 3: univariate filtering; statistical test differences were considered significant if the *P*-values were < 0.05.
AUD, alcohol use disorder; OR, odds ratios; ref, reference; CI, confidence interval.

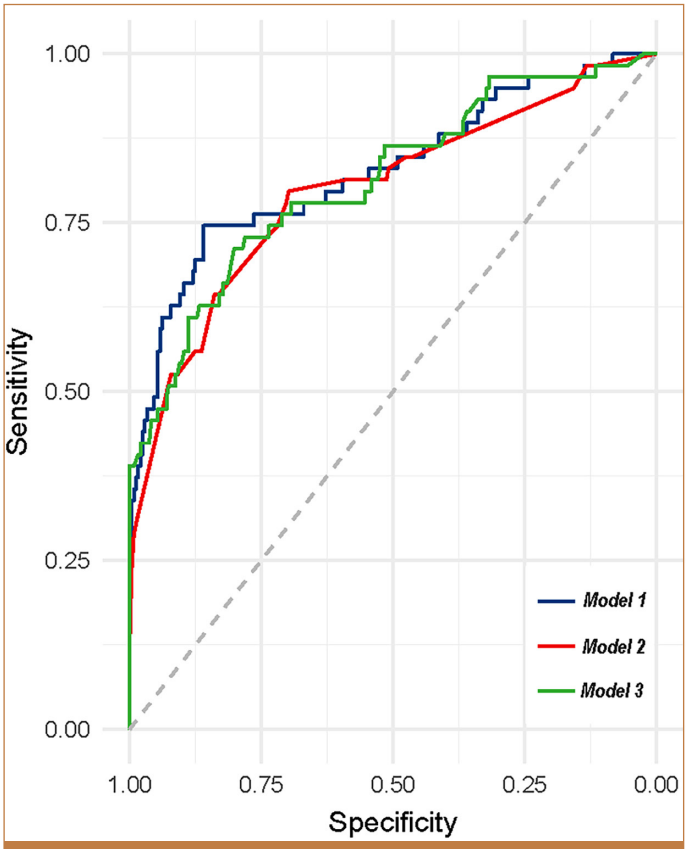

Figure 1. Predictive ability of the regression equations to comorbid AUD of patients with schizophrenia. AUC 1 = 0.83 (95% CI: 0.76-0.90, SE = 0.035, *P* < .001), AUC 2 = 0.80 (95% CI: 0.73-0.87, SE = 0.036, *P* < .001), AUC 3 = 0.81 (95% CI: 0.74-0.88, SE = 0.035, *P* < .001) AUC, the area under the ROC curve.

in patients with AUD.[27] Clinical observations suggest that patients with schizophrenia typically experience stabilization of psychiatric symptoms after adequate medication treatment. However, feelings of shame and excessive free time may contribute to a decline in social skills, thus leading to increased sensitivity and introversion in these individuals. In clinical practice, introverted patients with AUD often believe they drink to become more sociable. Mueller et al also studied gender differences in how alcohol dependent patients and healthy controls handle interpersonal problems.[28] This study revealed that male individuals with alcohol dependence perceive themselves as colder compared to male controls, whereas female individuals with alcohol dependence perceive themselves as significantly more vindictive, introverted, and invasive than female controls. As a result, it is hypothesized that female patients with AUD may derive greater benefit from gender-specific treatment approaches.

Smoking and alcohol abuse can be seen as externalized manifestations of anxiety and hopelessness traits, potentially resulting in diminished self-inhibition and impulsive behavior over time.[29] Impulsivity, characterized by reduced reflectiveness, hasty decision-making, and a lack of behavioral inhibition, is often associated with externalizing and conduct issues.[30] In our study, patients with schizophrenia and AUD exhibited obvious aggressive behavior, aligning with the findings of Fritz et al who suggested that alcohol abuse may diminish the capacity of individuals with schizophrenia to control aggressive impulses.[31] Furthermore, individuals diagnosed with schizophrenia or AUD who exhibit lower self-esteem are more likely to engage in self-directed aggression. Consequently, the authors proposed that enhancing self-esteem education in psychiatric patients could potentially mitigate violent behavior in clinical settings.

Schizophrenia poses a significant risk factor for suicide, particularly when comorbid with AUD,[32] substantially heightening susceptibility to suicidal ideation, attempts, and fatalities.[33,34] Patients with a predisposition to risk-taking and impulsive behaviors are especially vulnerable, as chronic alcohol intoxication can exacerbate maladaptive coping strategies and hinder self-regulation, thus increasing the probability of suicide.[35] Moreover, patients with an elevated susceptibility to schizophrenia may be particularly susceptible to the effects of alcohol on the frontal lobe and hippocampus, brain regions associated with memory functions.[36] Prolonged alcohol abuse leading to cognitive impairments could hamper emotion regulation, decision-making, and behavioral control,[37] thus increasing the risk of suicide.[38]

The pattern of onset is a critical determinant of treatment effectiveness and long-term outcomes for individuals diagnosed with schizophrenia. Typically, patients with an acute or subacute onset exhibit improved symptom management over time compared with those with a chronic onset.[39,40] However, regression models 2 and 3 revealed that acute or subacute onset was an independent risk factor for patients with AUD and comorbid schizophrenia, whereas model 1 did not show this finding. Given the lack of matching between the comorbidity and non-comorbidity groups concerning confounding factors, such as sex, disposition, and residential pattern, PSM analysis was used to assess the association between onset form and comorbidity. The results highlighted that acute/subacute onset remained a significant predictor of comorbid AUD in patients with schizophrenia.

A prior large-scale clinical study assessed the sequence of onsets in patients affected by comorbid alcohol use and bipolar disorder[41] and suggested that alcohol is used to alleviate stress and tension caused by impulsive temperament and anxiety disorders, potentially triggering depressive episodes. Furthermore, stimulant use may have triggered the first manic episode, with alcoholism stemming from the severity of the manic episode. It is speculated that alcoholics generally face significant psychological stress, and long-term drinking, particularly under stress, can lead to neuroadaptations. Consequently, patients with alcoholic addiction may exhibit dysfunction in stress pathways, such as the sympathetic adrenomedullary and hypothalamic–pituitary–adrenocortical axes, leading to dysregulation of the cortisol response and discrepancies in emotional regulation, further resulting in the development of acute psychotic symptoms as stress accumulates and alcohol consumption increases. Further study is warranted to explore the connection between acute onset and comorbidities.

Nevertheless, our study has several limitations. First, the cross-sectional design inherently lacks the ability to establish definitive cause-and-effect relationships. Second, the study did not carefully assess cognitive factors, despite evidence indicating the significance of executive dysfunction in patients with both schizophrenia and AUDs.[42] Third, the generalizability of our findings may be limited by variations in sample sources, geographical locations, and social cultures. Additionally, the three regression models, each employing distinct algorithms, have their unique strengths and weaknesses in identifying independent variables. However, the comparable AUC

Table 3. Characteristics of Patients with Acute/Subacute or Chronic Onset Latency by Propensity Score Matching

Variable	Overall (n = 149)	Onset latency		*P*
		Acute/subacute (n = 63)	Chronic (n = 86)	
Age	3.00 [26.00, 44.00]	34.00 [26.00, 46.00]	32.50 [26.00, 43.00]	.861
Age at onset	24.00 [20.00, 29.00]	26.00 [19.00, 29.00]	23.00 [20.00, 28.00]	.736
Sex (female)	67 (44.97%)	28 (44.44%)	39 (45.35%)	> .999
Marital status				.172
Unmarried	55 (36.91%)	22 (34.92%)	33 (38.37%)	
Married	62 (41.61%)	32 (50.79%)	30 (34.88%)	
Divorced	27 (18.12%)	8 (12.70%)	19 (22.09%)	
Others	5 (3.36%)	1 (1.59%)	4 (4.65%)	
Education				.407
Primary school or below	17 (11.41%)	6 (9.52%)	11 (12.79%)	
Junior highschool	59 (39.60%)	27 (42.86%)	32 (37.21%)	
Senior highschool	44 (29.53%)	15 (23.81%)	29 (33.72%)	
College degree or above	29 (19.46%)	15 (23.81%)	14 (16.28%)	
Disposition				.990
Introverted	32 (21.48%)	13 (20.63%)	19 (22.09%)	
Extroverted	117 (78.52%)	50 (79.37%)	67 (77.91%)	
Smoking	52 (34.90%)	23 (36.51%)	29 (33.72%)	.858
Residence				.303
With parents	83 (55.70%)	34 (53.97%)	49 (56.98%)	
With spouse	47 (31.54%)	23 (36.51%)	24 (27.91%)	
Alone	11 (7.38%)	2 (3.17%)	9 (10.47%)	
Others	8 (5.37%)	4 (6.35%)	4 (4.65%)	
Family relationships				.150
Harmony	60 (40.27%)	29 (46.03%)	31 (36.05%)	
Average	51 (34.23%)	16 (25.40%)	35 (40.70%)	
Inharmony	38 (25.50%)	18 (28.57%)	20 (23.26%)	
Family history of mental disorders	55 (36.91%)	23 (36.51%)	32 (37.21%)	> .999
History of alcoholism	18 (12.08%)	9 (14.29%)	9 (10.47%)	.651
Impulsivity	69 (46.31%)	30 (47.62%)	39 (45.35%)	.914
Suicide or self-injury history	19 (12.75%)	7 (11.11%)	12 (13.95%)	.791
Obvious aggressive behavior (MOAS)	72 (48.32%)	29 (46.03%)	43 (50.00%)	.754
With AUD	34 (22.82%)	20 (31.75%)	14 (16.28%)	.043*

the comparisons between age and age at onset of the two groups was conducted using the Mann–Whitney *U*-test, while the comparisons of rest variables was performed by the Fisher–Freeman–Halton test.
AUD, alcohol use disorder; MOAS, Chinese adaptation of the Modified Overt Aggression Scale.
*Denotes statistically significant *P*-values.

scores make it inconclusive as to which model effectively captures clinical significance.

Conclusion

In conclusion, our binary logistic regression and PSM analyses indicate that introverted disposition, smoking, acute onset, impulsivity, and suicide or self-injury history were independently associated with AUDs among inpatients with schizophrenia. Future studies should prioritize longitudinal studies to investigate the progressing nature of potential confounding risk factors.

Data Availability Statement: *The data that support the findings of this study are available from the corresponding author upon reasonable request.*

Ethics Committee Approval: *This study was approved by Ethics Committee of the Sixth Clinical Medical College of Hebei University (approval number: 201603+; date: March 16, 2016).*

Informed Consent: *Written informed consent was obtained from the patients/patient who agreed to take part in the study.*

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