Preplanned Studies

Association of Childhood Trauma Subtypes and Substance Use Among Chinese College Students — Jilin Province, China, 2021

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Summary

What is already known about this topic?

Childhood trauma represents a critical risk factor for substance use among young populations globally, presenting a substantial public health challenge.

What is added by this report?

This comprehensive investigation elucidates the distinct associations between specific subtypes of childhood trauma and substance use behaviors within the Chinese youth population. The findings demonstrate significantly elevated risks for smoking, e-cigarette use, and alcohol consumption, particularly among individuals who have experienced severe or multiple forms of childhood trauma.

What are the implications for public health practice?

Implementation of targeted interventions and support systems is essential for individuals with childhood trauma histories. Healthcare providers should emphasize early identification and trauma-informed care approaches. Policy frameworks promoting early intervention and sustained support mechanisms are crucial for reducing substance use behaviors and enhancing population health outcomes.

Substance use among college students represents a significant and growing public health challenge in China (*1*). Current data indicates cigarette use prevalence ranges from 7.8% to 13% among Chinese college students (*2*), while electronic cigarette use has shown an upward trend with rates between 3.1% and 5.5% (*3–4*). Alcohol consumption is particularly prevalent, with 34.2% to 49.3% of students reporting current alcohol use (*5*). Childhood trauma has emerged as a crucial determinant of substance use behaviors (*6*), encompassing distinct categories: emotional abuse (verbal assaults and intimidation), physical abuse (acts causing bodily harm), sexual abuse (traumatic sexual experiences causing psychological distress), emotional neglect (inadequate emotional support and nurturing), and physical neglect (insufficient provision of basic necessities). While research in China has extensively documented associations between childhood trauma subtypes and adult substance use (*7*), investigations focusing on adolescent and young adult populations remain limited. This comprehensive cross-sectional study, encompassing 63 universities in Jilin Province, employed logistic regression analyses to evaluate the impact of various childhood trauma types on substance use patterns while controlling for relevant confounding variables. Our findings demonstrate that participants who experienced severe emotional abuse, sexual abuse, or physical neglect during childhood exhibited significantly elevated risks of substance use. Moreover, we observed a dose-response relationship between cumulative trauma exposure and substance use likelihood, highlighting the critical need for trauma-informed interventions and targeted support strategies for this vulnerable population.

This cross-sectional study employed cluster sampling through an online survey conducted from October 26th to November 18th, 2021, encompassing 63 universities and colleges in Jilin Province, China. Student participants represented various provinces across China. Data collection utilized a Quick Response (QR) code distributed to all participants, with online informed consent obtained prior to questionnaire completion. Study inclusion criteria comprised: 1) age above 15 years; 2) correct responses to at least three of four attention check questions; 3) physiologically plausible height and weight values; 4) absence of logical contradictions, missing answers, or irrelevant responses; and 5) no apparent pattern-based responding. After the screening, 96,151 participants qualified for analysis (male=40,039, 41.64%; mean age=19.59). The study received approval from the Jilin University ethics committee (No: 20210929). Sociodemographic data, including gender, age, residence, per capita disposable income, ethnicity, and educational status, were collected and adjusted as

confounders in the logistic model. The Childhood Trauma Questionnaire (CTQ), a 28-item assessment tool, evaluated experiences of emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Respondents rated each item on a 5-point Likert scale from "Never True" to "Very often true," enabling detailed assessment of trauma frequency (*8*). The CTQ demonstrated good internal consistency with a Cronbach's alpha of 0.73. Substance use assessment included current smoking status, with follow-up questions distinguishing between e-cigarettes and traditional cigarettes (*9–10*). Alcohol consumption was categorized binarily as users versus non-users. Statistical analyses were conducted using SAS software (version 9.4, SAS Institute Inc., Cary, NC, USA). Logistic regression analyses calculated adjusted odds ratios (a*OR*s) comparing substance use prevalence between individuals with varying levels and types of abuse experiences versus those without trauma exposure. All childhood trauma subtypes were simultaneously included in the regression model to account for their independent effects.

Table 1 presents the sociodemographic characteristics of the study population. Overall, 13.24% of participants reported using cigarettes and/or electronic cigarettes, while 59.64% reported alcohol consumption. Among substance users, 4.37% reported concurrent use of cigarettes and electronic cigarettes. Table 2 elucidates the differential impact of childhood trauma subtypes on various forms of substance use, including smoking, cigarette use, e-cigarette use, and alcohol consumption. Participants who experienced severe emotional abuse, sexual abuse, and physical neglect during childhood demonstrated significantly elevated risks of substance use, with adjusted odds ratios (*aORs*) of 1.22 [95% confidence interval (*CI*): 1.04, 1.42] for emotional abuse, 1.54 (95% *CI*: 1.32, 1.80) for sexual abuse, and 1.11 (95% *CI*: 1.04, 1.19) for physical neglect. Our analysis further reveals the complex relationship between cumulative childhood trauma experiences and substance use behaviors (Table 3). Using participants who reported no childhood trauma as the reference group, we observed a dose-response relationship between the number of trauma types experienced and substance use likelihood. For individuals reporting a single trauma experience, the odds were elevated for smoking (*aOR*=1.15, 95% *CI*: 1.09, 1.21), e-cigarette use (*aOR*=1.15, 95% *CI*: 1.06, 1.25), and alcohol consumption (*aOR*=1.20, 95% *CI*: 1.16, 1.24). This pattern intensified with increasing trauma exposure: two trauma experiences (smoking: *aOR*=1.25, 95% *CI*: 1.19, 1.32; e-cigarette use: *aOR*=1.32, 95% *CI*: 1.22, 1.43; alcohol use: *aOR*=1.23, 95% *CI*: 1.19, 1.27), three trauma experiences (smoking: *aOR*=1.52, 95% *CI*: 1.41, 1.64; e-cigarette use: *aOR*=1.82, 95% *CI*: 1.64, 2.02; alcohol use: *aOR*=1.50, 95% *CI*: 1.42, 1.58), four trauma experiences (smoking: *aOR*=1.60, 95% *CI*: 1.44, 1.78; e-cigarette use: *aOR*=1.90, 95% *CI*: 1.64, 2.20; alcohol use: *aOR*=1.69, 95% *CI*: 1.56, 1.83), and five trauma experiences (smoking: *aOR*=1.82, 95% *CI*: 1.62, 2.05; e-cigarette use: *aOR*=2.48, 95% *CI*: 2.12, 2.89; alcohol use: *aOR*=2.03, 95% *CI*: 1.82, 2.26).

DISCUSSION

Our study examines the complex relationship between childhood trauma and substance use behaviors among Chinese adolescents and young adults, providing critical insights that advance both research understanding and intervention strategies. The findings from our comprehensive analysis, particularly those presented in Table 2 and Table 3, expand current knowledge by revealing sophisticated patterns and associations across diverse forms of childhood trauma and substance use behaviors (*11*).

The influence of childhood trauma on substance use behaviors demonstrated in our results aligns with established research highlighting the persistent effects of adverse childhood experiences (*11–12*). Emotional abuse emerged as a robust predictor across all substance use categories, including smoking, cigarette use, e-cigarette use, and alcohol consumption. The progressive increase in odds ratios corresponding to emotional abuse severity emphasizes the necessity for interventions targeting multiple dimensions of emotional maltreatment. Similarly, the pronounced impact of severe physical abuse on all forms of substance use reinforces the enduring consequences of physical maltreatment (*13*). Physical neglect exhibited a notable graded association with substance use behaviors, while sexual abuse emerged as a particularly potent predictor, demonstrating a clear dose-response relationship across all substance use outcomes. Furthermore, the distinct patterns observed in the association between emotional neglect and various substance use forms underscore the complexity of this relationship, warranting deeper investigation into the underlying mechanisms.

The cumulative risk hypothesis provides a theoretical framework explaining our findings, positing that the combined effect of multiple risk factors

TABLE 1. Sample sociodemographic characteristics, childhood trauma and substance use of 96,151 participants.

Variables	All (*N*=96,151, 100%)		Women (*N*=56,112, 58.36%)		Men (*N*=40,039, 41.64%)	
	Mean/N	SD/%	Mean/N	SD/%	Mean/N	SD/%
Age						
Mean (SD)	19.59	1.74	19.56	1.70	19.64	1.81
Ethnicity						
Han ethnic group	86,050	89.49	49,817	88.78	36,233	90.49
Others	10,101	10.51	6,295	11.22	3,806	9.51
Education background						
Undergraduate	90,554	94.18	53,047	94.54	37,507	93.68
Master	5,375	5.59	2,938	5.24	2,437	6.09
Doctoral	222	0.23	127	0.23	95	0.24
Area type prior to university/college enrollment						
Urban	48,899	50.86	29,109	51.88	19,790	49.43
Rural	47,252	49.14	27,003	48.12	20,249	50.57
Per capita disposable income (CNY)						
< 6,000	28,601	29.75	17,327	30.88	11,274	28.16
6,000–13,999	31,195	32.44	18,521	33.01	12,674	31.65
14,000–22,999	16,051	16.69	9,304	16.58	6,747	16.85
23,000–35,999	9,404	9.78	5,409	9.64	3,995	9.98
36,000–70,000	6,483	6.74	3,459	6.16	3,024	7.55
> 70,000	4,417	4.59	2,092	3.73	2,325	5.81
Substance use						
Any substance use	58,473	60.81	27,702	49.37	30,771	76.85
Cigarette use						
No	83,416	86.76	53,970	96.18	29,446	73.54
Electronic cigarette	470	0.49	194	0.35	276	0.69
Conventional cigarette	8,059	8.38	886	1.58	7,173	17.92
Both	4,206	4.37	1,062	1.89	3,144	7.85
Alcohol use						
Non-drinker	38,803	40.36	28,609	50.99	10,194	25.46
≤1 time a month	43,623	45.37	22,849	40.72	20,774	51.88
2–4 times a month	10,844	11.28	3,721	6.63	7,123	17.79
2–4 times a week	1,867	1.94	627	1.12	1,240	3.10
≥4 times a week	1,014	1.05	306	0.55	708	1.77
Childhood trauma						
Never experienced childhood trauma	38,534	40.08	24,903	44.38	13,631	34.04
Any type of trauma	57,617	59.92	31,209	55.62	26,408	65.96
Emotional abuse	12,786	13.30	7,830	13.95	4,956	12.38
Physical abuse	6,457	6.72	2,970	5.29	3,487	8.71
Sexual abuse	13,864	14.42	6,836	12.18	7,028	17.55
Physical neglect	39,219	40.79	20,242	36.07	18,977	47.40
Emotional neglect	37,665	39.17	20,270	36.12	17,395	43.45

Abbreviation: SD=standard deviation; CNY=Chinese Yuan.

TABLE 2. Adjusted odds ratios of substance use among participants with childhood trauma experience.

Childhood trauma experience	Substance use Smoker *vs.* non-smoker			Cigarette use Smoker *vs.* non-smoker			E-cigarette use Smoker *vs.* non-smoker			Alcohol use Drinker *vs.* non-drinker		
	aOR	(95% *CI*)	*P*	*aOR*	(95% *CI*)	*P*	*aOR*	(95% *CI*)	*P*	*aOR*	(95% *CI*)	*P*
Ever experienced childhood trauma Emotional abuse												
None	1			1			1			1		
Mild	1.16	1.11–1.22	<0.001	1.09	1.01–1.17	0.019	1.23	1.12–1.36	<0.001	1.17	1.12–1.23	<0.001
Moderate	1.22	1.09–1.37	0.001	1.25	1.07–1.46	0.004	1.36	1.12–1.67	0.002	1.25	1.11–1.39	0.001
Severe	1.22	1.04–1.42	0.013	1.63	1.34–1.98	<0.001	1.73	1.36–2.21	<0.001	1.23	1.06–1.44	0.006
Physical abuse												
None	1			1			1			1		
Mild	1.10	1.02–1.20	0.018	1.08	0.97–1.20	0.170	1.17	1.01–1.35	0.038	1.11	1.03–1.21	0.010
Moderate	0.98	0.87–1.10	0.725	0.98	0.85–1.12	0.742	1.02	0.85–1.23	0.826	1.00	0.89–1.12	0.988
Severe	0.98	0.85–1.13	0.799	0.99	0.84–1.18	0.942	0.95	0.76–1.20	0.685	0.99	0.86–1.14	0.880
Sexual abuse												
None	1			1			1			1		
Mild	1.39	1.32–1.46	<0.001	1.25	1.17–1.33	<0.001	1.35	1.23–1.48	<0.001	1.39	1.32–1.46	<0.001
Moderate	1.50	1.39–1.62	<0.001	1.48	1.35–1.61	<0.001	1.57	1.38–1.77	<0.001	1.50	1.40–1.62	<0.001
Severe	1.54	1.32–1.80	<0.001	1.27	1.06–1.51	0.008	1.55	1.24–1.95	0.001	1.39	1.20–1.62	<0.001
Physical neglect												
None	1			1			1			1		
Mild	1.11	1.07–1.15	<0.001	1.18	1.12–1.25	<0.001	1.11	1.02–1.20	0.012	1.09	1.05–1.13	<0.001
Moderate	1.21	1.16–1.27	<0.001	1.26	1.18–1.35	<0.001	1.24	1.13–1.37	<0.001	1.21	1.15–1.26	<0.001
Severe	1.11	1.04–1.19	0.003	1.35	1.24–1.47	<0.001	1.26	1.11–1.43	0.001	1.03	0.97–1.10	0.320
Emotional neglect												
None	1			1			1			1		
Mild	1.10	1.06–1.14	<0.001	0.86	0.81–0.90	<0.001	0.90	0.83–0.97	0.009	1.10	1.06–1.14	<0.001
Moderate	1.08	1.01–1.14	0.020	0.92	0.85–1.00	0.061	0.98	0.87–1.11	0.718	1.07	1.01–1.14	0.020
Severe	0.96	0.90–1.02	0.173	1.07	0.98–1.16	0.141	1.23	1.09–1.39	0.001	0.91	0.86–0.97	0.004

Abbreviation: *aOR*=adjusted odds ratio; *CI*=confidence interval.
* Adjusted for age, gender, ethnicity group, place of residence, and per capita disposable income.

TABLE 3. Oddsratios of substance use among participants with cumulative childhood trauma.

Cumulative childhood trauma experiences	Frequency		Any substance use *vs.* no substance use			Smoker *vs.* non-smoker			E-cigarette use *vs.* non-e-cigarette use			Drinker *vs.* non-drinker		
	N	%	*aOR*	(95% *CI*)	*P*	*aOR*	(95% *CI*)	*P*	*aOR*	(95% *CI*)	*P*	*aOR*	(95% *CI*)	*P*
Never	38,534	40.08	1			1			1			1		
One	24,559	25.54	1.20	1.16–1.24	<0.001	1.15	1.09–1.21	<0.001	1.15	1.06–1.25	0.001	1.20	1.16–1.24	<0.001
Two	20,730	21.56	1.26	1.21–1.31	<0.001	1.25	1.19–1.32	<0.001	1.32	1.22–1.43	<0.001	1.23	1.19–1.27	<0.001
Three	7,294	7.59	1.55	1.46–1.64	<0.001	1.52	1.41–1.64	<0.001	1.82	1.64–2.02	<0.001	1.50	1.42–1.58	<0.001
Four	3,080	3.20	1.71	1.58–1.86	<0.001	1.60	1.44–1.78	<0.001	1.90	1.64–2.20	<0.001	1.69	1.56–1.83	<0.001
Five	1,954	2.03	2.16	1.94–2.41	<0.001	1.82	1.62–2.05	<0.001	2.48	2.12–2.89	<0.001	2.03	1.82–2.26	<0.001

Abbreviation: *aOR*=adjusted odds ratio; *CI*=confidence interval.
* Adjusted for age, gender, ethnicity group, place of residence, and per capita disposable income.

exceeds the sum of individual risk exposures (*14*). Our analysis, detailed in Table 3, reveals a clear dose-response relationship between the number of trauma experiences and substance use behaviors, demonstrating that exposure to multiple forms of childhood trauma significantly increases the likelihood

of substance use. From a neurobiological perspective, cumulative trauma exposure may induce structural and functional alterations in key brain regions responsible for stress regulation, particularly the amygdala and prefrontal cortex, leading to compromised emotional regulation capabilities and subsequently elevated substance use risk (*14*). The substantially increased odds of substance use among individuals with multiple trauma experiences underscore the critical importance of implementing targeted interventions and preventive strategies for this vulnerable population.

This study was subject to several limitations warrant consideration. The reliance on self-reported data introduces potential recall and social desirability biases, while the cross-sectional design precludes definitive causal inferences. Future research would benefit from longitudinal cohort studies that track participants over extended periods to elucidate the temporal relationship between trauma exposure and substance use patterns. Time-lagged analyses could further illuminate the dynamic progression from trauma exposure to subsequent substance use behaviors. Additionally, while our large sample size enhances statistical power and generalizability, it also presents methodological challenges. In samples of this magnitude, even minor differences can achieve statistical significance, necessitating careful interpretation of effect sizes alongside *P* values.

Our findings underscore childhood trauma as a significant predictor of substance use behaviors, emphasizing the necessity for multi-tiered intervention strategies. Healthcare providers should implement trauma-informed care protocols, recognizing the profound impact of childhood trauma on substance use patterns. Early identification and intervention are crucial, particularly in clinical settings where trauma histories may influence treatment outcomes (*15*). Mental health professionals must consider both psychological and somatic manifestations when evaluating and treating patients with trauma histories. From a policy perspective, priority should be given to developing comprehensive programs that prevent childhood trauma and mitigate its effects through family support initiatives, trauma education, and expanded mental health services. Implementation of evidence-based policies supporting early intervention and sustained support for trauma-affected individuals can significantly reduce substance use burden and enhance population health outcomes.

Conflict of interest: No conflicts of interest.

Funding: High-Level Public Health Talent Development Program, Beijing Municipal Health Commission.

doi: 10.46234/ccdcw2025.027

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Submitted: July 26, 2024
Accepted: October 21, 2024
Issued: January 31, 2025

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