Adverse childhood experiences and interaction with methamphetamine use frequency in the risk of methamphetamine-associated psychosis

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ABSTRACT

Background: This study aims to examine adverse childhood experiences (ACEs), its interaction with methamphetamine (METH) use (e.g., frequency, duration, and dependence) and METH-associated risk of psychosis.

Methods: This was a cross-sectional study conducted among METH users at a drug rehabilitation center in China. Participants were assessed using Mini International Neuropsychiatric Interview for METH-associated psychosis.

Results: Of 189 participants, 50.5% reported at least one of eight ACE categories and 35.4% had past history of a psychotic episode. After adjusting for age, sex, education, and marital status, all ACE categories except emotional abuse and parental separation or divorce increased the risk of ever experiencing METH-associated psychosis. When comparing participants who reported no ACEs, those with three or more ACEs had higher risks of lifetime psychosis (OR = 4.5, 95% CI: 1.6–12.6). Relationship between number of ACEs and lifetime psychosis was graded ($p < .01$). The interaction between frequency of METH use (≥ 4 vs. <4 times/month) and number of ACEs on the risk of METH-associated psychosis was statistically significant ($p = 0.02$), showing a trend of adjusted OR decreased significantly as the number of ACEs increased.

Conclusions: These analyses indicate that childhood adversities increase the individual's vulnerability to METH-associated psychosis. Further larger longitudinal studies are warranted.

1. Introduction

One of the major health consequences of methamphetamine (METH) use is psychosis. METH-associated psychosis is a transient psychotic state closely resembling paranoid schizophrenia (Grant et al., 2012). Persecutory delusions and auditory hallucinations are frequently reported characteristics of METH-associated psychosis. Other symptoms have also been reported but less consistently, including bizarre behavior, thought reading, visual hallucinations, and delusion of reference (Grant et al., 2012; Mcketin et al., 2006; Srisurapanont et al., 2003).

Prior studies have examined whether the likelihood of experiencing psychotic symptoms was related to high doses of METH use or higher among dependent users. Most, but not all of these studies, found such positive associations (Mcketin et al., 2006; Sulaiman et al., 2014). Some other studies found that METH users who have a pre-existing proneness to psychosis are at a higher risk of experiencing symptoms of psychosis (Chen et al., 2003; Mcketin et al., 2006). Childhood trauma has consistently been shown to increase the risk of adult psychosis and other psychiatric disorders (Daalman et al., 2012; Green et al., 2010; Kelleher et al., 2008; Read et al., 2012; Shevlin et al., 2007; Varese et al., 2012). These findings suggest that childhood trauma may be a strong predictor or a good marker for this pre-existing proneness. Benjet et al. (2013) reported positive associations of childhood trauma with drug dependence, raising the question of whether psychosis associated with childhood trauma was primarily due to changing severity of METH use and whether the relationship between heavy METH use and psychosis holds

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when adjusting for childhood adverse experiences (ACEs). In addition, Bramness et al. (2012) suggested a new explanation that childhood adversities may increase individuals' vulnerability to the psychotic effects of METH. However, little research has been done to address these issues.

The aims of this study were: (a) to assess the prevalence of ACEs and its relationship to psychosis among METH users with or without adjustment for METH use (e.g., frequency, duration and dependence); (b) to investigate whether the association between METH use and psychosis holds when accounting for having ACEs; (c) to estimate the multiplicative effect, or interaction, between the number of ACEs and METH use on the risk of experiencing symptoms of psychosis.

2. Subjects and methods

2.1. Participants

This was a cross-sectional study conducted in 2013 among 189 METH users recruited from a government-operated drug rehabilitation center in Zhejiang province, China. Eligibility criteria included being 17 years or older, having used METH at least once within 30 days prior to entering rehabilitation, and reporting METH as the main drug choice within the last 12 months prior to entering rehabilitation. Interviews were conducted using standardized structured questionnaire divided into two parts. The first part included questions about socio-demographics, drug-use behaviors and ACEs. For the first part, study participants had the option of completing the survey by himself/herself or being interviewed face-to-face by a trained interviewer. The second part consisted of questions related to psychotic disorders and was administered face-to-face by a trained interviewer using the Mini International Neuropsychiatric Interview (M.I.N.I.).

Prior to conducting interviews, all eligible participants received appropriate information to facilitate the informed consent process. Written informed consent was obtained from each participant before administering the interview. Study methods were reviewed and approved by the Institutional Review Board of Fudan University.

2.2. Measures

2.2.1. METH use and dependence.
Frequency of METH use within 3 months prior to drug rehabilitation, dates of first METH use and last METH use were recorded. Duration of METH use was measured as the length of years between first and last METH use. METH dependence was defined according to ICD-10 symptom checklist or mental disorders: psychoactive substance use syndromes module (WHO, 2004).

2.2.2. Other drug use.
Illicit drug use during lifetime was measured for other drugs, including heroin, opiate, ecstasy, ketamine, magu (a mixture of METH and caffeine), marijuana, cocaine, methadone, dolantine, morphine, cough syrup, and any other illicit drugs named by study participants.

2.2.3. Adverse childhood experiences (ACEs).
All questions related to ACEs occurred during the participants' first 18 years of life (Whitfield et al., 2005). The categories are verbal abuse, physical abuse, contact sexual abuse, a battered mother, household substance abuse, household mental illness, incarcerated household members, and parental separation or divorce (Table 1). For each of the above questions, dummy variables were created, coded as 1 if participant answered "yes" and 0 if participant answered "no". Exposure to ACEs is captured in the ACE score. The ACE score is a simple summation (integer count) of exposure to each of eight categories of ACEs during participants' first 18 years of life. Exposure to any ACE category counts as one point on the score.

2.2.4. Lifetime METH-associated psychosis.
All responses were made using the Mini-International Neuropsychiatric Interview-Plus (MINI-Plus), Module M (Sheehan et al., 1998). If a participant met criteria for substance-induced psychotic disorder, he or she was asked whether the symptoms occurred only after using METH or other illicit drugs to exclude psychosis induced by other drugs. Only those reported the symptoms occurred only after using METH was diagnosed as having METH-associated psychosis. The reliability and validity of this measurement have been tested and are comparable to the Structured Clinical Interview for Diagnostic and Statistical Manual (DSM)-III-R patient version diagnoses (SCID-P) and the Composite International Diagnostic. This procedure has been used previously to measure the prevalence of psychotic symptoms among METH users (Srisurapanont et al., 2003; Sulaiman et al., 2014).

2.3. Statistical analyses

All statistical analyses were performed using the SAS 9.2 (SAS Institute Inc., Cary, NC). The total number of ACEs was added for each respondent (range, 0–8). Due to the small sample size, we combined ACE scores of three or more to create a variable

Table 1
Definition and prevalence of ACEs by lifetime METH-associated psychosis (N = 189).

	N (%)
Childhood abuse	
Emotional	42 (22.2)
Did a parent or other adult in the household. . .	
(1) Often or very often swear at you, insult you, or put you down?	
(2) Sometimes, often, or very often act in a way that made you think that you might be physically hurt?	
Physical	22 (11.6)
Did a parent or other adult in the household. . .	
(1) Often or very often push, grab, slap, or throw something at you?	
(2) Often or very often hit you so hard that you had marks or were injured?	
Sexual	26 (13.8)
Did an adult or person at least 5 years older ever. . .	
(1) Touch or fondle you in a sexual way?	
(2) Have you touch their body in a sexual way?	
(3) Attempt oral, anal, or vaginal intercourse with you?	
(4) Actually have oral, anal, or vaginal intercourse with you?	
Household function	
Household substance abuse	43 (22.7)
(1) Live with anyone who was a problem drinker or alcoholic?	
(2) Live with anyone who used street drugs?	
Mentally ill household member	7 (3.7)
(1) Was a household member depressed or mentally ill?	
(2) Did a household member attempt suicide?	
Battered mother	22 (11.6)
Was your mother (or stepmother). . .	
(1) Sometimes, often, or very often pushed, grabbed, slapped, or had something thrown at her?	
(2) Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard?	
(3) Ever repeatedly hit over at least a few minutes?	
(4) Ever threatened with or hurt by a knife or gun?	
Incarcerated household member	
(1) Did a household member go to prison?	10 (5.3)
Parental separation or divorce	
(1) Were your parents ever separated or divorced?	16 (8.5)
Number of ACEs (ACE score)	
0	93 (49.2)
1	42 (22.2)
2	29 (15.3)
3	17 (9.0)
≥4	8 (4.2)

with four categories (0, 1, 2, or ≥3). Pearson's correlations (r) were estimated among ACEs, drug use variables and METH-associated psychosis. Crude and adjusted odds ratios (ORs) and 95% confidence intervals (CI) were obtained from logistic regression models that estimated the likelihood of having ever experienced METH-associated psychosis by each of eight ACE categories. Analyses were repeated with the summed score as three dichotomous variables (yes/no) with zero experience as the referent, or as a continuous variable (0, 1, 2, ≥3), or as a dichotomous variable (0, ≥1). Covariates in all multivariate models (Model 1) include age (<30 vs. ≥30 years old), sex, education level (illiterate or primary vs. middle school and above) and marital status (single vs. married or divorced or widowed).

To determine the strength of the relationship between METH use and lifetime METH-associated psychosis while controlling for any confounding role of ACEs, we further added three METH use variables (e.g., frequency, duration and dependence) as well as lifetime use of other drugs into the multivariate models (Model 2). Finally, we explored the interactions between either frequency of use (≥4 vs. <4 times/month) or duration of use or dependence and the number of ACEs (0, 1, 2, or ≥3) on the risk of lifetime METH-associated psychosis in separate interaction models.

3. Results

3.1. Characteristic of study participants

The study sample consisted of 189 participants, 74.6% of which were men. Among all participants, 42.3% were aged less than 30