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Risks and predictors of current suicidality in HIV-infected heroin users in treatment in Yunnan, China: A controlled study

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Abstract

Objective—Suicide is an important public health problem in China. Elsewhere injection drug use and HIV infection have independently been associated with suicidality, but research has often overlooked these high-risk groups in China. We determined the frequency and predictors of suicidal ideas in Chinese, HIV-infected (HIV+) and uninfected (HIV-) heroin injection drug users in treatment (IDUs) and a control sample. We hypothesized that rates of suicidal ideas would be significantly higher among IDUs compared to controls, and highest among HIV+ IDUs.

Method—We assessed suicidal ideas within the past two weeks in HIV+ (N = 204) and HIV- (N = 202) heroin IDUs in methadone treatment in Yunnan, a province at the intersection of the heroin and HIV epidemics, and in demographically matched, uninfected non-drug using controls (N = 201).

Results—Rates of suicidality were higher in IDUs than controls but there was no additive effect of HIV infection (HIV+ IDU 43.1%; HIV- IDU 37.1%; controls 8.5%). Among HIV+ IDUs suicidality was associated most strongly with a combination of prior history of major depression, low perceived social support, and experience of HIV-relevant stress, but not with AIDS diagnosis. Among HIV- IDUs suicidality was associated with prior history of major depressive or alcohol use disorder. Less than 25% of IDUs with suicidality had histories of mood or alcohol use diagnoses.

Conclusion—Because suicidal ideation is frequent in IDUs in China, regardless of HIV status, and is not fully accounted for by past psychiatric history, additional research may be warranted.

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Keywords

IV drug use; HIV; Depression; Suicide; China

INTRODUCTION

Suicide is a major public health concern in China, where it is the fifth leading cause of death (1). The overall annual suicide rate in China (19 per 100 thousand) is now above the range reported for the United States (11 per 100 thousand) and the European Union (2). A recent community prevalence survey in Beijing and Shanghai reported lifetime rates of suicidal ideation (3.1%), plans (0.9%), and attempts (1%), (3) comparable to contemporaneous rates in the United States (4). Consistent with findings in North America and Europe, in China individuals with psychiatric disorders, particularly major depression and schizophrenia, have elevated past and current rates of suicidal ideation and behaviors (5). Important "at-risk" populations for suicide identified in other countries, however, appear to have been overlooked in the China context, including HIV-infected (HIV+) individuals, injection drug users, and individuals with both conditions (6, 7, 8).

In China, as elsewhere, injection drug use and HIV-infection are intersecting epidemics (9). Heroin addiction has grown dramatically alongside social and economic development, with the number of registered drug users (those identified and enrolled in government treatment programs) increasing from 70,000 in the 1990's to over 1.6 million by 2005 (9). The number of "unregistered" drug users is thought to be much higher (10). Over 80% of former heroin users in treatment present with depressive symptoms (11, 12, 13). The HIV epidemic in China was first recognized in the mid-1980s among IDUs in the border region adjacent to Myanmar (Burma), Thailand, and Laos, a region known as the "Golden Triangle." Sentinel surveillance and epidemiological studies indicated that HIV prevalence among IDUs in the southern provinces exceeds 5%, and in some areas is much higher (30–80%) (9). Injection heroin users (IDUs) account for the largest proportion of HIV-infected individuals in China (over 40%; 3). Although data from Western countries suggest that substance abusers and HIV+ individuals are at increased risk for both co-morbid psychiatric disorders and suicide (6, 7, 8), to our knowledge no prior study has examined HIV infection and suicidality in injection heroin users in China.

In 2006 the interdisciplinary NeuroAIDS research teams at the HIV Neurobehavioral Research Center (HNRC) at the University of California at San Diego (UCSD), the China Centers for Disease Control (CDC), and the Mental Health Institute at Peking University began collaborating on a neuropsychiatric study in IDUs in treatment in the Chinese province of Yunnan, an epicenter of the heroin and HIV epidemics.. This article reports the frequency of suicide-related thoughts and behaviors, and characteristics associated with the risks of suicidality in HIV+ and HIV- IDUs in treatment, compared with demographically similar Chinese non-drug using controls in the same region. We hypothesized that rates of suicidal ideation would be elevated in HIV+ IDUs and HIV- IDUs compared to non-IDU controls, and that the prevalence of suicidality would be highest among HIV+ IDUs in treatment. We explored whether other factors would increase risks for suicidal ideas, including lifetime histories of major depression and alcohol use disorders, perceived social support, and (in HIV+) AIDS status and HIV-related stress.

METHODS

The parent research program was a four-year longitudinal project to examine the neurobehavioral effects of HIV infection in injection heroin users in Yunnan, China. The

study was approved by the Institutional Review Boards (IRBs) of the China Centers for Disease Control (CDC)/National Center for AIDS (NCAIDS), the Peking University, Beijing, China, and the University of California, San Diego (UCSD). All participants provided written informed consent to enroll in the research. Participants completed a baseline evaluation lasting 3.5 to 4 hours and those who were IDUs in treatment were asked to return for follow-up assessments every 12 months thereafter. Compensation for each assessment was \$10 US. This paper presents data from the baseline evaluation.

Participants

Individuals in treatment for IDU were recruited from two outpatient methadone clinics at Kunming and GuJiou in the province of Yunnan by flyers, announcements, and approach by the treating staff. In China methadone clinics are sponsored by the government and all registered injection heroin users receive free methadone, substance abuse-related counseling, and screening for HIV serostatus (HIV quick test, OraSure Technologies, Inc., Bethlehem PA, USA). We enrolled 204 HIV+ and 202 HIV-negative (HIV-) injection heroin users in treatment (over 90% of those screened for eligibility). Participants were men and women, age 18–55 years, with either HIV-positive serostatus or an HIV-negative screening. Participants had to be ambulatory, literate with at least three years of formal education, and able to comprehend study procedures and provide informed consent. Because the primary aim of the study was evaluation of HIV-associated neurocognitive impairment, we attempted to exclude conditions which might confound neuropsychological evaluation. Exclusions were 1) evidence of non-HIV or non-heroin related neurocognitive disorders (e.g., seizure disorder); 2) evidence of schizophrenia or bipolar disorder; and 3) individuals with “heavy substance use within the past 30 days” defined as more than three drinks of alcohol daily or the use of illegal psychoactive substances three or more times weekly. In order to establish norms for neurocognitive assessments, we also advertised the research generally to the community for a control sample. We enrolled 201 non-injection drug using controls that were comparable to the two IDU groups in treatment with respect to age, gender, education, and ethnicity (99% Han ethnicity) and who met the same inclusion and exclusion criteria as the treated IDU groups. At least 90% of those screened for eligibility were enrolled. All controls had a negative HIV screen and were assessed with the same study protocol.

Measures

Participants underwent a structured psychiatric interview, comprehensive neuromedical and neuropsychological evaluations, and assessments of mood, perceived social support, HIV-relevant stress, and daily function as described below. All instruments were administered in the Chinese language by Chinese psychiatrists and psychiatric nurses who had been trained by the U.S. team in the study instruments. In HIV+ participants disease duration and staging, using U.S. Centers for Disease Control criteria (14), and current immune status (CD4 cell count) were also determined, as was treatment status (on or off antiretrovirals; ARVs). The neuropsychological findings will be reported elsewhere.

World Mental Health Composite International Diagnostic Interview (WMH-CIDI, version 3.0)

We administered the Chinese version of the Composite International Diagnostic Interview (CIDI), developed by the World Health Organization (WHO), as part of the World Mental Health Survey initiative (15). It is a fully-structured, lay-administered psychiatric interview: lifetime (past) and current (within the last 30 days) rates of major depression and alcohol and opioid use disorders (abuse and dependence) were assessed using the Depression and Substance Use modules of the CIDI.

Evaluation of suicidality

Suicidality was based on responses to item 9 of the Beck Depression Inventor-II (16), consisting of statements ranging from 0 = “I have no thoughts of killing myself”; 1 = “I have suicidal thoughts but would not carry them out”; 2 = “I would like to kill myself” or; 3 = “I would kill myself if I had a chance.” Endorsements of 1 on item 9 were coded positive for suicidality. The reporting period was the past two weeks.

Social support, self-perceived stressors, and everyday function

Perceived social support, stressors due to HIV infection, and lack of independence in everyday function were examined, because isolation, stressors, and inability to function were predicted to impact on suicidal ideation. Social support was measured using the Social Support Rating Scale, developed in China for psychiatric research (17). Social support is rated from 1 to 4 in response to ten questions. Ratings are summed to yield a total score ranging from 10 to 40; a higher total score indicates higher levels of perceived social support. For example, one item prompt asks for a description of relationships between the respondent and work or social colleagues, with choices being 1 = “We never talk about personal concerns with each other”; 2 = “My colleagues would be somewhat concerned if I had difficulties”; 3 = “A few colleagues would be concerned about me a lot”; or 4 = “Most colleagues would be concerned about me a lot.”

Perceived stressors among HIV+ participants were assessed using the Chinese Modified HIV Stressor Scale (18). This measure was developed by translating an established English language questionnaire (the HIV Stressor Scale, 19) and modified by adding queries about two additional stressors: being rejected by family members, and being discriminated against in general. The scale administered consisted of 26 HIV-relevant negative life events participants might have experienced in the past four weeks. Survey items cover five areas: relationships (eg, revealing HIV status to lover), medical care (eg, changing physicians), grief (eg, death of friend), financial (eg, loss of income), and work (losing health insurance). Items are rated on a scale ranging from 0 = “Never stressful” to 4 = “Extremely stressful.” Ratings for each item were summed to yield a total score ranging from 0 to 104; a higher total score indicates higher levels of self-perceived HIV-relevant stress.

To measure independence in daily functioning we used the Chinese version of the Activities of Daily Living (ADL) Scale, a 14-item questionnaire with demonstrated validity in studies of medically ill and dementia populations in China (20, 21, 22). The 14 items address both physical self-maintenance activities (e.g., dressing, walking and bathing) and instrumental activities of daily living (e.g., preparing meals, housework). Each item is rated on a 4-point scale: 1 = “No difficulty at all”; 2 = “Have some difficulty”; 3 = “Need some assistance”; 4 = “Can’t do at all.” Scores for each item are summed; a total score > 15 indicates difficulty or need of assistance in at least one area of daily function and resulted in classification as “dependent” in activities of daily living.

Statistical analysis

Descriptive analyses and group comparisons examined the demographic and clinical characteristics of non-drug using controls and treated IDU groups with and without HIV infection.

Group comparisons were tested with one-way ANOVA for continuous variables and chi-square tests for categorical variables. Univariate correlates of suicidal ideas were assessed using Pearson correlation tests for continuous variables and chi-square tests for analyses of categorical variables.

Two multivariable logistic regressions examined predictors of suicidal ideation separately in HIV + and in HIV- treated IDUs. The regression limited to HIV+ IDU participants included demographics (i.e., age, years of education, employment status, gender, and marital status), level of social support, dependency in activities of daily living, and prior (excluding current) histories of major depression or an alcohol use disorder (abuse or dependence) as potential predictors, as well as specific HIV-relevant characteristics (i.e., level of HIV stress, years since first HIV+ test, history of an AIDS diagnosis, and current {on/off} antiretroviral status) and substance use information (i.e., years of injection drug use) as potential predictors.

In the second regression with the HIV- IDU cohort we excluded HIV-related variables as potential predictors, but considered the same demographic, social support, daily living, psychiatric and substance use variables as above. Stepwise selection based on the Akaike Information Criterion (AIC) was used to identify the optimal model (23). We chose this approach rather than standard step-wise methods, since AIC is thought to generate models more likely to be applicable to populations outside the dataset from which the predictors were identified (i.e., AIC avoids over-fitting of individual covariates).

The critical alpha level was set at 0.05 for statistical significance. All comparisons were two-tailed. No adjustments were made for multiple comparisons in part because some of the analyses were exploratory and because the final two multivariate analyses do not consider the results of the univariate analyses. Analyses were performed using the Statistical Package for the Social Sciences program (SPSS-PC, Windows V10.0) and the R statistical software package (24).

RESULTS

Frequency of major depressive disorder, alcohol use disorder, and suicidality

The 201 non-drug using controls and 406 injection drug users in treatment (202 HIV- and 204 HIV+) who completed the baseline evaluation are included in the analyses. In terms of demographic and clinical characteristics (see Table 1) the treated IDU groups and matched non-IDU controls consisted of mostly men in their mid-30s, with a middle school education and above average household income for the area. There was a slight but statistically significant group difference in age, but age was not related to suicidality in this study. High proportions of individuals in the HIV- and HIV+ IDU groups in treatment were neither married nor employed, which was significantly different from non-drug using controls. About one in four of the HIV-infected individuals had AIDS. In the HIV-positive group overall there was evidence of satisfactory immune function as evidenced by current CD4 count. With reference to psychopathology, the lifetime frequency of major depressive disorder was significantly (over four-fold) higher in treated IDUs compared to controls ($p = .005$), but the rates did not differ meaningfully between the HIV-infected and uninfected IDUs in treatment. Rates of current depressive disorder were low, with none of the controls and only 1% ($n = 4$) of treated IDUs having current major depression.

Lifetime frequency of any alcohol use disorder, which ranged from approximately 10% to 20%, did not differ significantly between IDU groups and controls, or between HIV-infected and uninfected IDUs in treatment. Despite our effort to exclude current substance abusers, about 2% of the entire cohort ($n = 12$) reported a current (within the last 30 days) alcohol use disorder. Rates of current alcohol use disorder did not differ across groups. Nearly the entire sample (99%) of treated IDUs reported a lifetime history of heroin abuse or dependence, which is consistent with the fact that IDUs were recruited from methadone clinics. Again, despite our screening efforts approximately 2% ($n = 8$) of treated IDUs met

criteria for a current heroin use disorder, with HIV+ and HIV- IDUs having similar frequencies.

As also seen in Table 1, the two IDU groups were significantly more likely to express current suicidal ideas (as measured by item 9 of the BDI-II) than controls ($p < .0001$), with over one in three IDUs in treatment reporting suicidality compared to fewer than 1 in 10 controls. Further, about 4% of patients endorsed the most severe category (eg, “Would kill myself if I had a chance”), whereas none of the controls did so. Overall rates were slightly higher in HIV+ IDUs than HIV- IDUs in treatment but this difference was not statistically significant. Due to the small number of cases, formal analysis of a “gradient” of severity of suicidal ideation across these latter groups was not performed.

We assessed the relationship of current suicidal ideas to history of major depression and current mood: of those in our cohort who expressed suicidal ideas a minority had a lifetime history of major depression (17% in HIV+ IDUs, 13% in HIV- IDUs, 0% in controls). Most participants who reported current suicidal ideation had total depressive symptoms in the clinically relevant range (i.e., BDI-II total scores ≥ 19 ; 88% in HIV+ IDUs, 90% in HIV- IDUs, 41% in controls). A minority of our cohort who expressed suicidal ideas had a lifetime history of an alcohol use disorder (17% in HIV+ IDUs, 32% in HIV- IDUs, 6% in controls).

Correlates of suicidal ideas in IDUs and controls

Among the entire cohort (i.e., in treatment IDUs and controls; $N = 607$), factors significantly correlated with current suicidal thinking included being unmarried or unemployed, having a lifetime (past) history of major depression, or lifetime alcohol use disorder or heroin use disorder (all p -values $< .0001$). Higher BDI-II total score (excluding item 9, $p < .0001$), poor social support ($p = .0003$), and the need for assistance in activities of daily living ($p = .0013$) were also significantly associated with current suicidality in treated IDUs and controls. Among treated IDUs ($n = 407$), past history of major depression ($p < .0001$), or past alcohol use disorder ($p = .0052$), and higher BDI-II total score ($p < .0001$) were associated with current suicidality as was longer duration of injection drug use ($p = .0297$), and poor social support ($p = .0283$). Among HIV+ IDUs ($n = 204$), experiencing HIV-relevant stress was significantly associated with current suicidality ($p = .0041$). The correlation between social support and HIV stress was small but significant ($r = -0.2311$, $p = .0009$).

Multivariable predictors of suicidal ideas in HIV+ and HIV- IDUs

Multivariable predictions of current suicidality in the HIV+ ($n = 195$ with complete data) and HIV- ($n = 202$) IDU samples were examined separately, as explained above. The final AIC-based regression model for the HIV+ IDUs was highly significant ($p < .0001$) and included HIV-related stress, social support, and prior history of major depression. Prior history of major depression ($p < .01$) uniquely predicted current suicidal ideas in treated HIV+ IDUs, but high HIV-relevant stress ($p = .06$) and low social support ($p = .14$) did not. Past major depression was associated with a six-fold increase in risk of current suicidal ideation (OR 6.12, CI 1.68, 22.33). In HIV- treated IDUs the best regression model selected via AIC included prior history of major depressive disorder, and prior history of an alcohol use disorder. This overall regression model also was highly significant ($p < .001$). Both prior history of major depression ($p < .01$) and prior alcohol use disorder ($p < .001$) were uniquely significant. Prior major depression increased risk by six-fold (OR 6.10, CI 1.58, 23.61), and past alcohol use disorder increased risk by three-fold (OR 3.44, CI 1.58, 23.61).

DISCUSSION

The high frequency of current suicidality in our IDU sample in treatment is consistent with previous work on treated heroin users in China, 33% of whom reported suicidal thoughts in the month after detoxification (25), and is consistent with Western settings (25). This exceeds the 12-month prevalence rate of 3% observed in population-based Chinese community surveys (3, 27). Our finding of lifetime history of major depression as a significant risk for suicidal ideas in HIV+ and HIV- IDUs in treatment agrees with risks identified in general population epidemiologic studies in China (5). Our finding of alcohol use disorder as a risk in HIV- IDUs differs from results of epidemiological surveys in the general metropolitan Chinese population (3). Studies in the US of both the general population (28) and heroin abusers report a strong association of alcohol use disorders with suicidality (29).

Although the two treated IDU groups differed from non-IDU controls in lower employment rates and increased likelihood of ADL dependence, these indicators of poor life functioning did not predict suicidal ideation. Within the HIV+ IDU group, social factors (stress and poor support) were associated with suicidal ideation, whereas AIDS and duration of HIV disease, and alcohol use disorder were not. Our prevalence rate of recent suicidal ideas is consistent with rates in United States studies of HIV + samples not selected for methadone treatment of heroin abuse (30), but in that work neither alcohol nor heroin abuse predicted suicidality.

Over the past 20 years epidemiological research in China has observed a relatively low lifetime prevalence of major depression (eg, 3–4%) compared to four-to five-fold higher rates in Western societies (31). Our in-treatment heroin users were more likely than the general population to have a lifetime major depressive disorder (eg, 6–8%). Nevertheless, the high rate of current suicidal ideation may not be entirely explained by depressive syndromes. Some research argues that adverse life events and lack of social support are more related to suicidality than is depressive disorder in China (32). Our finding that HIV-related stress and perception of low social support were among the predictors of suicidal ideation in HIV+ persons is consistent with this view. Suicidal ideation in patients in heroin treatment in China also may be related to social issues (eg, loss of income), to the stigma of being a drug abuser, or to treatment-related factors (32, 33). There are civil and criminal penalties for drug use in China, and individuals may volunteer for drug treatment or be sentenced to enforced treatment. Our study participants were in a voluntary methadone program; we are not sure whether drug treatment would increase suicidal ideation. One China study suggested that severity of depressive symptoms was equivalent between heroin users in enforced drug treatment and those who sought treatment voluntarily (13).

Our study has several limitations. First, our cross-sectional design is unable to address causality in the relationship between suicidality and clinical and social risks. Second, our findings regarding suicidality in these IDU groups in treatment may underestimate the true rates in that we cannot rule out possible reluctance to reveal suicidal thoughts due to fear of stigma, or other reasons. Finally, our analysis of correlates and predictors of suicidality was based on a convenience sample that was not recruited using formal epidemiologic methods designed to ensure representativeness of a particular population.

Despite these limitations, our study provides evidence that suicidality is frequent in Chinese injection heroin users in treatment, and that co-morbid mood and alcohol use disorder, as well as HIV-relevant stressors and social isolation may contribute to risk in this vulnerable population. This suggests that assessments and interventions for suicide might be incorporated into a comprehensive care plan.

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Table 1

Demographic and clinical characteristics of HIV+ and HIV- injection drug users In treatment (IDU) and non-IDU controls in Yunnan, China

Variable	Non-IDU Controls (N = 201)	HIV-IDU (N = 202)	HIV+IDU (N = 204)	p
<i>Demographic Characteristics</i>				
Age (Mean years ± SD)	34.9 ± 6.4	34.5 ± 4.4	36.8 ± 4.9	<.0001
Education (Mean years ± SD)	9.9 ± 2.3	9.9 ± 6.6	9.7 ± 2.4	0.88
Sex (% male)	65.7	65.2	65.8	0.99
Employment Status (% employed)	95.5	45.6	52.5	<.0001
Marital Status (% married)	77.1	32.7	33.7	<.0001
Monthly Household Income (Mean USD ± SD)	335 ± 264	393 ± 1213	384 ± 847	0.77
<i>Clinical Characteristics^a</i>				
AIDS Diagnosis (%)	--	--	28.4	--
Currently taking antiretrovirals (%)	--	--	24.0	--
Nadir CD4 (Median, IQR)	--	--	350 (196, 507)	--
Current CD4 (Median, IQR)	--	--	464 (345, 692)	--
Time Since 1 st HIV± Test (Mean years ± SD)	--	--	1.5 ± 1.6	--
<i>Psychiatric Characteristics</i>				
Major Depressive Disorder (%)				
Current (last 30 days)	0	1.0	1.0	0.37
Lifetime	1.5	8.8	6.4	0.005
Alcohol Use Disorders ^b (%)				
Current (last 30 days)	2.0	2.0	2.0	0.99
Lifetime	12.4	19.3	15.7	0.17
Heroin Use Disorders ^b (%)				
Current (last 30 days)	0	98.5	99.0	<.0001
Lifetime	0	99.0	99.0	<.0001
Duration of Injection Drug Use (Mean years ± SD)	--	13.1 ± 5.0	13.4 ± 4.8	0.43
Beck Depression Inventory (Mean total ± SD)	7.1 ± 7.6	19.1 ± 11.1	19.9 ± 10.7	<.0001
Suicidal Ideation (%) ^c				
Thoughts of killing myself	8.5	33.5	31.0	<.0001
Would like to kill myself	0	5.4	2.0	0.002
Would kill myself if I had the chance	0	4.4	4.5	0.01
Any suicidal ideas	8.5	43.2	37.1	<.0001
Dependent in Activities of Daily Living (%)	5.0	16.2	10.9	0.001
Social Support Scale (Mean total ± SD)	35.5 ± 5.8	31.7 ± 12.3	33.5 ± 9.7	0.0003
HIV Stressor Scale (Mean total ± SD) ^a	--	--	34.4 ± 19.8	--

Note:

^a Variables restricted to the HIV+ IDU group (N = 204).

^b Substance use disorders are defined as meeting criteria for a DSM-IV diagnosis (abuse or dependence).

^cFrom Beck Depression Inventory-II, item 9. Participants can chose only one, and answers refer to any time in the last 2 weeks.