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Psychiatric Context of Human Immunodeficiency Virus Infection among Former Plasma Donors in Rural China

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Abstract

Background—China's HIV epidemic commenced in its agrarian provinces through contaminated commercial plasma donation centers and is now becoming a public health concern nationwide. Little is known of the psychiatric and substance use disorder characteristics of this population, or their impact on everyday function, employment, and life quality.

Methods—HIV infected (HIV+) former plasma donors (N = 203) and HIV-negative (HIV-) donor controls (N = 198) completed the World Mental Health Survey Composite International Diagnostic Interview to determine lifetime major depressive disorder (MDD), substance use disorders, and suicidality. Current mood and suicidality were assessed with the Beck Depression Inventory-II. Everyday function was measured by an Activity of Daily Living questionnaire; life quality was evaluated by the Medical Outcomes Study-HIV.

1. Introduction

The vast majority of HIV infection occurs in the non-Western world, yet most research on the psychiatric and neurobehavioral background and impact of the pandemic derives from studies in North America and Western Europe (Bing et al., 2001; Rabkin 2008). This is unfortunate since the psychological and social context of HIV, its index populations, routes of acquisition and transmission, and its consequences may differ across cultures (Jin et al., 2006). Some of the distinctive characteristics of the non-Western epidemic may be particularly evident in China, where it is estimated there are 10 to 20 million infected individuals (China CDC, 2003; Zheng et al., 2001), or up to 10 times the combined number of persons infected in North America and Europe. In the West the initial HIV epidemic began in urban areas among a sexually active gay population. In China, by contrast, the epidemic commenced in rural populations via contaminated blood product collection and transfusion and then spread to an urban, injection drug-using population (China CDC, 2003). From the late 1980s to the mid-1990s a large number of commercial plasma collection

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companies, some using non-sterile techniques, operated in the major agrarian provinces of China, where a subset of the population repeatedly donated plasma to supplement their incomes. Although these plasma centers soon came under strict governmental regulation to prevent the further spread of HIV and other pathogens, a sizeable number of individuals unknowingly had either been exposed to or infected with HIV.

Over 20 years of research in North America and Europe has documented elevated rates of mood and substance use disorders in communities at high risk for HIV compared to the general population (Atkinson et al., 1988; Bing et al., 2001; Maj, 1996; Rabkin, 2008; Williams et al., 1991). In North America HIV-infected (HIV+) gay men and in drug using samples the lifetime prevalence of major depression (which approaches 40%) is two-fold or more higher than in the general population (e.g., Bing et al., 2001; Ciesla and Roberts, 2001). Rates of substance use disorder (e.g., up to 70% in some settings) uniformly are at least three times higher than might be expected based on age and gender (e.g., Bing et al., 2001). Onset of mood and substance use syndromes often precedes likely date of infection (e.g., Atkinson et al., 1988; Atkinson et al., 2009; Rabkin, 2008), with episodes recurring throughout the course of chronic infection (Rabkin, 2008). Depression symptom scores are mildly elevated compared to uninfected populations, but in the range observed in other medical illnesses (e.g., Evans et al., 2005). There is often acute emotional distress on notification of infection, including suicidal ideation, which remits in most individuals over a period of weeks (Atkinson et al., 2009; Jacobsen et al., 1990; Perry, 1994). Substance use often persists after HIV infection, but studies suggest the rates of current abuse or dependence have been lower than might be expected, perhaps reflecting the burden of co-morbid medical illness or adoption of a “healthier” lifestyle (Atkinson et al., 2008).

Whether the above findings in western nations pertain to China is uncertain, given the lack of systematic research. Our own preliminary results suggested there may be differences in the presentation and pattern of psychiatric disorders. In a small sample of HIV+ individuals and negative controls (HIV-), which were recruited from both urban and agrarian settings, we observed that almost 80% of seropositive persons met criteria for lifetime major depressive disorder, compared to 4% of controls (Jin et al., 2006). In contrast to the Western experience, the large majority of cases of affective illness commenced after notification of HIV status. Although the HIV+ group had been infected on average for 2 years, scores on depression inventories were in the clinically significant range, and almost 20% expressed current suicidal ideation. In contrast, none of the controls exhibited depressive symptoms in the clinically significant range, nor reported current suicidal thoughts (Jin et al., 2006). As might be expected, everyday functioning was more impaired in infected individuals -- but depression symptoms independently predicted significant impairment in daily functioning over and above the effects of HIV (Jin et al., 2006). Although the underlying causes of this seemingly higher rate of major depression and suicidality were unclear, we speculated on several possibilities. Since at the time these data were collected there was limited HIV/AIDS education in China, there was widespread belief that HIV infection was a “terminal” diagnosis. Next, social stigmatization of HIV was thought to be more severe in China than in some Western settings. Moreover, medical insurance and social welfare systems were not generally available, posing an additional stressful burden. To follow up on these findings teams at the HIV Neurobehavioral Research Center (HNRC) at the University of California, San Diego, the China Center for Disease Control (China CDC), and the Mental Health Institute at Peking University collaborated on a larger-scale attempt to estimate the prevalence of major depression, suicidality, and substance use disorders and their impact on everyday functioning in samples from two major known China risk groups: an agrarian sample of former plasma donors, and an urban injection drug-using sample.

This report describes results obtained from HIV+ and HIV- former plasma donors with no other known risk for HIV infection. Aims of the research were to estimate the prevalence and predictors of major depression, depression symptoms, and suicidality and assess their impact on daily function and life quality. Features of the research design included recruitment of demographically comparable HIV+ and HIV- samples from the same risk group, and use of standardized measures for psychodiagnostic assessment, mood, and perceived life stress, along with evaluation of everyday functioning and life quality. We hypothesized that (1) the prevalence of major depression, suicidality, and substance abuse would be higher in HIV+ individuals than in HIV- controls, and (2) in the HIV+ sample severity of depression symptoms would be associated with diminished social support, greater stress, more impaired daily function, and worse life quality independent of HIV disease status and demographic factors.

2. Methods

2.1. Neurobehavioral Effects of HIV and Host Genetics in China

This report summarizes the baseline psychiatry-related findings from an ongoing 5-year longitudinal cohort study examining the entitled “Neurobehavioral effects of HIV and host genetics in China.” The study was approved by the Institutional Review Boards (IRBs) of the China CDC/National Center for AIDS, Peking University, and the University of California, San Diego (UCSD). Written informed consent was obtained from participants after full explanation of the research procedures. Participants with elevated depression symptoms or current suicidal were referred for clinical evaluation as indicated.

2.2 Participants

Recruitment procedures and sample characteristics are described in detail elsewhere (Heaton et al., 2008). In brief, 198 HIV- and 203 HIV+ adults were enrolled from Anhui Province, China. Almost all were of Han ethnicity (> 99%) and were raised and resided in a rural area. All shared the infection risk of being former plasma donors. The distinguishing characteristic was that HIV+ individuals had donated plasma significantly more frequently than HIV- persons, thus arguably having had more exposure to contaminated equipment (Heaton et al., 2008). Inclusion criteria were (1) documented HIV status; (2) age 18-55 years; (3) ambulatory; and (4) literate and able to comprehend the study procedures. Because the main aim of the parent study was to evaluate the neurocognitive effects of HIV, individuals with a known history of non-HIV related factors that might impair performance on neuropsychological testing were excluded from the study (e.g., current psychoactive substance use disorder; head injury, seizure disorder, chronic hepatic or renal failure). In addition, individuals were excluded for severe acute HIV-related disease (e.g., pneumocystis carinii infection), history of severe psychiatric illness (e.g., schizophrenia) or for inability to function independently. All participants received the HIV Quick Test (Orasure Technologies, Inc, Bethlehem, PA) to confirm HIV serostatus. Infection with the Hepatitis C Virus (HCV) was assessed using enzyme-linked immunoassays (ELISA).

Table 1 presents the demographic and clinical characteristics of the sample. In general participants were early middle age, married men with a primary school education, and limited family income. HIV+ and HIV- groups were comparable in terms of age, education, and gender distribution. As might be expected HIV+ individuals had donated plasma significantly more often than HIV-negatives (52.2 ± 95.4 vs. 13.2 ± 23.9; $p < .0001$), were less likely to be employed, had a lower annual income, and were more likely to be widowed. Based on the epidemiology of the epidemic in China, the estimated duration of likely infection was approximately 10 years. Because testing had only recently become available, the mean duration of known HIV seropositivity was about 2 years. Beginning in 2003

antiretroviral treatment became widely available for patients with a diagnosis of AIDS. In terms of United States CDC criteria the majority of infected participants had frank AIDS and most of these were receiving antiretroviral treatment (almost 60%); about 50% of those with AIDS had severe immunosuppression (CD4+ lymphocyte count < 200). HCV infection was nearly universal in HIV-positive participants, but the majority of HIV-negative controls also were HCV-infected. Consistent with central nervous system findings in Western HIV samples with advanced disease, China HIV+ participants (almost 40%) were significantly more likely than HIV-individuals to demonstrate impaired global performance on detailed neuropsychological testing ($p < .0001$). Additionally, HIV-infected individuals were significantly more likely than controls to test positive for HCV infection ($p < .0001$).

2.3 Procedure

All participants underwent comprehensive standardized neuromedical, neurocognitive and psychiatric examinations, which included evaluation of everyday function and social support. The standardized neuromedical evaluation included detailed inquiry about prior and current exposure to an extensive list of conventional and alternative medical treatments, including antiretroviral and psychiatric medications (e.g., antidepressants and anxiolytics). HIV+ individuals were assigned a CDC stage, and CD4 lymphocyte counts were obtained. Neuropsychological test performance, using a battery of 17 individual neuropsychological measures assessing seven cognitive domains, was used to generate a classification of global neurocognitive impairment status (impaired/unimpaired; see Heaton et al., 2004, 2008 and Cysique et al., 2007 for detailed description of the process of developing normative standards using this battery on HIV- China samples).

2.4 Measures

2.4.1 World Mental Health Composite International Diagnostic Interview (WMH-CIDI, version 3.0)—Developed by the World Health Organization (WHO) and utilized in the WMH survey, the Chinese version of the CIDI (Kessler and Ustan, 2004) is a fully-structured, lay-administered psychiatric interview administered by trained personnel to assess for a wide range of psychiatric disorders. We surveyed for major depressive disorder (MDD), alcohol use disorder, and other substance use disorders based on DSM-IV criteria. This choice of diagnostic modules was based on the high prevalence of these disorders in other HIV+ populations. Because of time constraints of the parent protocol we did not assess for mania. The CIDI has good correspondence with clinician-administered psychiatric interviews (Haro, 2006). Lifetime suicidal ideation was surveyed based on four suicide-related questions from the depression module of the CIDI (Module E). The stem questions ask about any period of two weeks or more in the respondent's life when the individual was "Thinking a lot about death" (E 18); had "Suicidal thoughts during low mood" (E 19a); "Made a plan for suicide" (E 19b); or "Had a suicide attempt" (E 20).

2.4.2 Beck Depression Inventory-II (BDI-II)—Severity of depressive symptoms during the past two weeks was evaluated by the 21-item Chinese version of this standard measure of somatic (e.g., weight loss) and affective (e.g., depressed mood) depressive symptoms (BDI-II; Beck et al., 1996; Zheng, 1987). Current suicidality was evaluated by responses to item 9 of the inventory (0 = "No thoughts of killing myself," 1 = "Thoughts of killing myself," 2 = "Would like to kill myself," 3 = "Would kill myself if I had the chance").

2.4.3 Medical Outcomes Study-HIV (MOS-HIV)—To asses health-related quality of life we used the Chinese version of this 35-item self-report measure (Wu et al., 1997; Lau et al., 2006), which yields scores ranging from 0 (worst possible) to 100 (best possible), for various domains of physical, social, and emotional functioning. For purposes of the current

study, two summary scores, physical health summary (PHS) and mental health summary (MHS), were considered in the analyses (Revicki et al., 1998).

2.4.4 Modified HIV Stressor Scale—Self-perceived stress among HIV+ participants was assessed with the Chinese Modified HIV Stressor Scale (Au et al., 2004). The scale consists of ratings of 26 negative life events participants might have experienced in the past four weeks, using a 4-point scale ranging from 1 = "A bit stressful" to 4 = "Extremely stressful." For the current study, we used the one item from this scale that inquired about the degree to which the respondent experienced social stigmatization due to others' knowledge of the person's HIV+ status. Any response score > 0 on item 11 ("felt being discriminated") of the Modified HIV Related Stress Scale indicates that the individual experienced social stigma due to others' knowledge of the individual's HIV+ status.

2.4.5 Activities of Daily Living (ADL)—The Chinese modified version of the Activities of Daily Living questionnaire measured everyday function (Heaton et al., 2008; Lawton and Brody, 1969; Zhang et al., 1990). The translated14-item ADL scale, widely used in medically ill and dementia populations in China, describes the degree of independent function in daily tasks (e.g., dressing, preparing meals, using transportation). Items are rated on a 4-point scale ranging from 1 = "No difficulty" to 4 = "Cannot do at all." A total score ≥ 15 indicates that an individual needs assistance in at least one daily task. Participants with total scores ≥ 15 on the ADL scale were classified as ADL-dependent.

2.4.6 Social Support Scale—Social support was measured by using the self-report Social Support Rate Scale developed in China for psychiatric research (Xiao, 1993). Level of social support is rated from 1 to 4 in response to 10 stem questions. Ratings are summed to yield a total from 4 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."

2.4.7 Statistical Analyses—The primary dependent variables of interest were all non-normally distributed as assessed with the Shapiro-Wilk W test (all *p*s < .05). Accordingly, all subsequent analyses were undertaken using a nonparametric approach, including Wilcoxon Rank Sums test for between-group comparisons for continuous variables and Pearson chi-square test for categorical variables. In addition, separate linear and logistic regression analyses were undertaken with variables thought to be associated with ADL functioning, quality of life, and depressive symptoms. The critical alpha level was set at the standard 0.05 value for all statistical analyses, which were performed using JMP software (version 7.0, SAS Institute, Cary, NC, USA).

3. Results

3.1 Major Depression and Substance Use Disorders

Approximately 14% of HIV+ participants compared to 5% of HIV- individuals met criteria for a lifetime major depressive episode ($p < .003$). Rates of current (one month) major depression were low (1-2%) and similar in infected and uninfected groups (see Table 1). In the HIV+ group the majority of individuals with lifetime major depression were women (16/28). A minority (4/28) of HIV+ individuals reported a current major depressive episode. Because in Western countries onset of mood disorder commonly precedes date of documented HIV infection, we examined the timing and context of first episode of major

depression in the present cohort. In the 28 HIV+ persons with lifetime major depression, 9 experienced the first onset of mood disorder before testing seropositive, 9 reported the onset within the same year of testing seropositive, and 10 noted the first episode of mood disorder after testing seropositive. For these 10, the initial episode commenced on average about 1.5 years after testing positive. No participants in either group had been treated with antidepressants, and only two (1%) were receiving anxiolytics (i.e., diazepam).

As for substance use disorders, lifetime rates of alcohol use disorder (abuse or dependence) in HIV+ individuals were more than double those in the HIV- group ($p < .01$). Apart from alcohol, no other lifetime substance use diagnoses were detected. By design individuals with a *current* substance use disorder were excluded from the study. All diagnoses of a lifetime alcohol use disorder were in men. In the 29 HIV+ persons with an alcohol use disorder who could estimate age of onset of this condition, 27 experienced onset before knowledge of seropositivity. Typically onset occurred in the individuals' mid-20s, on average about 12.2 years before testing seropositive. There were no differences in lifetime and current rates of MDD and alcohol use disorders in HIV+ participants diagnosed with (N = 114) and without (N = 89) frank AIDS.

We also examined the relationship of MDD and alcohol use disorders to history of plasma donation. Considering the entire cohort of HIV+ and HIV- participants, those with a lifetime history of MDD reported significantly more ($p < .003$) lifetime plasma donations (mean = 62.4 ± 127.2) than those without MDD (mean = 29.9 ± 122.6). Similarly individuals with lifetime alcohol use disorder had donated plasma significantly more often (mean = 61.4 ± 122.6) than those without alcoholism (mean = 29.8 ± 64.2; $p < .03$). Within the HIV+ group, however, there were no differences in number of donations between those with or without lifetime major depression or alcoholism.

3.2 Depression and Suicidality

Although the prevalence of *current* major depression was comparable in infected and control groups, the HIV+ group had significantly higher Beck Depression Inventory (BDI) scores than the HIV- group. This was true even when "somatic" items (items 14-16, 18, and 20), which might be elevated due to medical illness, were excluded from scoring (see Table 1). In terms of descriptive categorization of total BDI scores, about 10% of HIV+ persons (21/203) could be classified with "severe" depression symptoms (BDI > 29); whereas another 10% (21/203) had "moderate" symptoms (BDI 17-29); the remainder reported either "mild" (139/203; BDI 10-16), or "minimal" symptoms (22/203; BDI < 10). When comparing distributions of BDI scores across the four descriptive categories between the HIV+ and HIV- groups, the HIV+ group had a significantly greater percentage of individuals reporting "moderate" or "severe" depressive symptoms than the HIV- group (42% vs. 17%; $p < .005$). Mean scores and their distribution were comparable in HIV+ men and women. As a group, individuals with a history of MDD (N = 28) had higher BDI scores than those without a history of MDD (N = 175; mean = 18.0 ±15.4 vs. mean = 10.2 ±10.2; $p < .05$). Severity of depression symptom scores were not significantly correlated with demographic (age, education, gender) or HIV illness characteristics (most recent and nadir CD4+ lymphocyte count, time since known HIV+ test, or AIDS status). To examine predictors of current marked depressive symptoms (BDI ≥ 17) among HIV+ participants we performed a logistic regression analysis, which included social support, impaired global neuropsychological (NP) functioning, household income, HCV status, AIDS diagnosis, experience of HIV-related stigmatization, gender, lifetime history of major depression, and lifetime history of alcohol use disorder. The overall model accounted for a significant amount of variance ($R^2 = 0.14$, $\chi = 33.29$, $p < .0001$). Lack of social support, the experience of stigmatization, and lifetime history of major depression (coeff = -0.07, $p = .0127$; coeff =

0.61, $p = .0011$; coeff = 0.67, $p = .0070$) were the only significant independent predictors of marked depressive symptoms.

Current suicidality in HIV+ persons, as indexed by responses to item #9 of the BDI, was low, with only about 3.0% (6/203) expressing definite suicidal ideation (i.e., would "like to" commit suicide or would do so "if they had the chance") compared to approximately 1.5% (3/198) in uninfected controls. Among HIV+ persons those with AIDS (N = 114) were more likely to report current suicidal ideation than those without AIDS (16% vs. 5%, $p < .05$), and to report lifetime suicidal thoughts (15% vs. 6%, $p < .05$) and suicide plans (12% vs. 3%, $p < .05$).

In terms of lifetime rates of suicidality, responses on the CIDI indicated that in each instance HIV-infected persons were over twice as likely as controls to endorse a component of suicidality (thinking "a lot" about death, suicidal ideas, suicide plan, or attempt; $p < .05$). Participants with a lifetime history either of MDD, or an alcohol use disorder, or of both conditions were significantly more likely to report suicidal ideation on the CIDI (all ps < .03). HIV+ participants with a lifetime history of MDD were significantly more likely to report any suicidality ($p < .0001$) compared to HIV+ participants without a history MDD. Sixty-four percent of HIV+ individuals with a lifetime history of MDD reported a lifetime history of suicidal ideation, 54% had a plan, and 14% had made an attempt compared to 4% (suicidal ideation), 2% (suicide plan), and 0% (suicide attempt) of HIV+ individuals without a history of MDD.

3.3 Relationship of Psychiatric and Medical Status to Everyday Function and Life Quality

In a logistic regression analysis that included current presence of marked depressive symptoms (BDI ≥ 17), history of alcohol use disorder, impaired global NP functioning, HCV status, and AIDS diagnosis, the overall model accounted for a significant amount of variance in dependence on others for help in every day function (ADL-dependent; $R^2 = 0.13$, $\chi = 17.40$, $p = .0038$). The strongest independent predictor of dependence in everyday function was presence of clinically meaningful depressive symptoms, followed by AIDS diagnosis (coeff = 0.81, $p = .0013$; coeff = 0.60, $p = .0450$ respectively). The same model predictors also accounted for a significant amount of variance in current employment status ($R^2 = 0.06$, $\chi = 12.82$, $p = .0251$). Presence of marked depressive symptoms and AIDS (coeff = 0.39, $p = .0393$; coeff = 0.49, $p = .0128$) were the only significant independent predictors of current unemployment.

In a linear regression analysis that included presence of marked depressive symptoms, history of alcohol use disorder, impaired global NP functioning, HCV status, and AIDS diagnosis, and with mental health quality of life as the outcome (as measured by the MOS-HIV), the overall model accounted for a significant amount of variance ($\chi = 69.88$, $p < .0001$). Meaningful depressive symptoms (coeff = -5.29, $p < .0001$) proved to be the only significant independent predictor of worse mental health quality of life. In another linear regression analysis using the same set of predictors, and with MOS-HIV physical health quality of life as the outcome, the overall model accounted for a significant amount of variance ($\chi = 47.38$, $p < .0001$). Depressive symptoms and AIDS diagnosis (coeff = -4.41, $p < .0001$; coeff = -1.67, $p = .0082$) proved to be the only significant independent predictors of lower physical health quality of life.

4. Discussion

The lifetime prevalence of major depression in HIV-infected former plasma donors in this agrarian setting was almost three times higher than in the uninfected comparison group. Lifetime prevalence of MDD in our control group is in line with more recent CIDI-based

studies indicating that the population prevalence may have risen to about 4% in the wake of modernization (e.g., Lee et al., 2009; Zhang et al., 2010). Even so, the rates of mood disorder in the general population and in HIV+ samples in China is many-fold lower than in North American and European settings. Consistent with data from Western settings (e.g., Atkinson et al., 2008; Rabkin, 2008), in a substantial proportion of cases the first episode of mood disorder occurred before knowledge of HIV infection. All episodes of major depression in the uninfected group commenced after the date of likely contamination of the donor pool by HIV; by contrast in the infected group onset of first depressive episode preceded contamination of the plasma donor pool by HIV in one of every three cases. These data suggest that in China, as elsewhere, MDD is prevalent in at-risk HIV populations, and that depressive episodes often are likely to precede infection. Perhaps somewhat surprising in view of the presence of HIV-infection and AIDS, the strongest predictors of current marked depression symptoms were not physical illness but rather presence of low social support and sense of social stigmatization. This is consistent with findings in other countries (e.g., Lesserman, 2008; Vanable et al., 2006).

Current suicidal ideation, as measured by the Beck Depression Inventory, was infrequent and comparable in infected and uninfected individuals (about 1%). Nevertheless seropositives were at least twice as likely to report lifetime suicidality than their uninfected counterparts. Recent epidemiologic studies of rural areas in China using comparable CIDI methodology report lifetime prevalence of suicidal ideation, plans, and attempts at 2.8%, 1.6%, and 1.3% (Ma et al., 2009). These rates for ideation and plan are lower than in our HIV+ participants, although our relatively small sample size (N = 203) may make these comparisons unstable. Our findings are also in line with recent reports supporting an association of suicidality with mental disorder (Zhang et al., 2010). Population-based studies in Western countries suggest that suicide is more prevalent in HIV than in the general population, and in more than 50% of cases there is co-morbid mood disorder (Keiser et al., 2010).

The elevated prevalence rates of HCV in both the HIV+ (> 90%) and HIV- (> 60%) groups is likely to be attributed to the fact that all study participants are former plasma donors from rural China, a group previously identified as having a high risk of HCV infection (Qian et al., 2006). In a separate report from this study cohort, our own group previously reported that HCV increases risk of neurocognitive impairment in HIV+ and HIV- individuals (Heaton et al. 2008), and HCV may contribute to differences in outcomes between groups in the present study. Nevertheless we found that HCV was not a significant predictor of everyday function, current employment status, current depressive symptoms, or health-related quality of life. Additional research is needed to clarify the role of HCV in HIV outcomes.

The adverse impact of MDD on everyday function and employment is recognized worldwide (e.g., Murray and Lopez, 1996). Our finding that the presence of marked depressive symptoms was at least as strong a predictor of everyday function as unemployment and life quality as AIDS reflects findings in other cohorts (Lesserman, 2008). Moreover it reinforces the importance of detecting and treating depression even in the severely medically ill.

4.1 Limitations

Our study has several limitations. The WMH CIDI diagnosis of major depression, based on DSM-IV core symptoms of low mood and anhedonia, may underestimate rates of depression in China and elsewhere in Asia, where cognitive impairment and somatic symptoms are thought more likely to be core phenomena (Chang et al., 2008; Lee et al., 2009). Second the China WMH CIDI does not query for number of depressive episodes, so characteristics, like

recurrence, could not be estimated. An important omission is that we did not examine participants for bipolar disorder. Because of the design of the parent study, individuals with current substance use disorders were excluded. Next, the sample is drawn from an agrarian setting. Although China's heterogeneous population is 75% rural (e.g., Lee et al., 2009), it is unclear what proportion engaged in plasma donation. Moreover, the China HIV epidemic is now mostly concentrated in urban injection drug-users (Zhang and Ma, 2002), a population likely to be very different from those in our study. Finally since the research was exploratory, and no adjustment was made for multiple statistical comparisons, these findings would need to be confirmed by future studies.

4.2 Clinical Implications

This study found high lifetime rates of major depression and suicidality in an HIV-infected agrarian cohort, even in an era in which modern antiretroviral treatment is becoming widely available in China. The sources of this elevated rate are unclear but could include pre-HIV mood disorder, direct effects of HIV itself, social stigma attendant to HIV, the negative impact of HIV/AIDS on employment, or the persisting perception that HIV is a terminal condition. In any case the high proportion of mood disorder suggests that efforts to detect and treat depression in HIV populations should be a component of comprehensive care, in China as well as elsewhere.

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Table 1

Demographic and clinical characteristics of HIV negative controls and HIV-infected individuals

Variable	HIV Negative Controls (N = 198)	HIV-Infected Individuals (N = 203)	*p*
Demographic Characteristics			
Age (years)	40.3 ± 6.3	40.2 ± 6.4	0.72
Education (years)	6.0 ± 2.0	5.0 ± 2.0	0.05
Sex (% male)	61	61	0.92
Currently Unemployed (%)	4	78	< .0001
Marital Status (% married)	96	89	0.01
Total Household Income (dollars)	710.0 ± 513.7	476.3 ± 412.7	< .0001
Psychiatric Characteristics			
Alcohol Use Disorder (%)			
Lifetime	6	14	0.004
Age of onset	29.1 ± 10.0	24.4 ± 5.4	0.56
Major Depressive Disorder (%)			
Current (last 30 days)	1	2	0.43
Lifetime	5	14	0.003
Age of onset	34.9 ± 10.6	34.1 ± 11.0	0.76
Beck Depression Inventory			
Total score	6.6 ± 9.6	11.3 ± 11.3	< .0001
Non-somatic score	4.6 ± 7.4	8.0 ± 8.8	< .0001
Current Suicidality (%)			
No thoughts of killing myself	88	86	0.42
Thoughts of killing myself	10	11	0.68
Would like to kill myself	1	2	0.19
Would kill myself if had chance	1	1	0.98
Lifetime Suicidality (%)			
Think a lot about death	7	16	0.004
Think about suicide	6	11	0.06
Made suicide plan	3	8	0.02
Made suicide attempt	1	2	0.43
ADL Dependent (%)	3	11	0.002
MOS-HIV (summary score)			
Physical		48.3 ± 9.7	
Mental		48.8 ± 9.9	
Social Support Scale (total score)	36.8 ± 6.0	35.0 ± 6.8	0.01
Clinical Characteristics			
AIDS (%)		56	
Cognitively Impaired	19	37	< .0001
CD4 (%)			

Variable	HIV Negative Controls (N = 198)	HIV-Infected Individuals (N = 203)	*p*
Current < 200		26	
Nadir < 200		52	
HCV Seropositive (%)	63	93	< .0001
On ARV Drugs (%)		57	
Age at First HIV+ Test		37.9 ± 6.7	
Years Since First HIV+ Test		2.5 ± 2.1	

Note: ADL = Activities of Daily Living; AIDS = Acquired Immunodeficiency Syndrome; HCV = Hepatitis C Virus; HIV = Human Immunodeficiency Virus; MOS-HIV = Medical Outcomes Study – HIV Questionnaire; ARV = Anti-retroviral. Unless noted, data represent means and standard deviations.