

Negative life events and major depressive disorder among HIV-positive individuals in Guangdong, China

A cross-sectional study

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Abstract

HIV-positive individuals encounter a number of negative life events (NLEs). This cross-sectional study aimed to evaluate the association between NLEs and major depressive disorder (MDD) among HIV-positive individuals in Guangdong, China, about which little is known.

HIV-positive individuals were recruited from the Centers for Disease Prevention and Control of Guangzhou, Zhongshan, and Yangjiang from September 2007 to September 2008. Data on NLEs were collected using a questionnaire. The Structured Clinical Interview for DSM-IV-TR Axis I Disorders-Patient Edition (SCID-I/P) based on the DSM-IV criteria was used to diagnose MDD. Multiple logistic regression analyses were conducted to evaluate the association between NLEs and MDD.

Among the 339 participants, 306 (90.27%) reported that one or more NLEs had ever occurred. Participants who reported NLEs that included HIV infection, financial problems, AIDS diagnosis, HIV/AIDS discrimination, conflict with spouse or lover, conflict with other family members, problems in childbearing, and conflict with nonfamily were at a higher risk of MDD. Participants who reported more NLEs in the last year had a higher risk of MDD ($OR=2.86$, 95%CI: 1.76–4.65) than individuals who reported fewer NLEs. Individuals with higher chronic stress scores had a higher risk of MDD ($OR=4.36$, 95%CI: 2.44–7.78) than individuals with lower chronic stress scores. However, acute stress was not associated with MDD.

NLEs were common among HIV-positive individuals. MDD was associated with a greater number of NLEs and the increased chronic stress caused by the NLEs. Interventions should be tailored to those who reported NLEs to help reduce the risk of MDD and increase the quality of life among HIV-positive individuals.

Abbreviations: CDC = Centers for Disease Prevention and Control, CI = confidence interval, DSM-IV-TR = Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition, Text Revision, GMV = gray matter volume, IQR = interquartile ranges, MDD = major depressive disorder, NLE = negative life event, OR = odds ratio, SCID-I/P = Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition, Text Revision (DSM-IV-TR) Axis I Disorders-Patient Edition, YLD = year lived with disability.

Keywords: chronic stress, HIV, major depressive disorder, negative life events

1. Introduction

Depression is one of the most common and costly psychiatric disorders. Approximately one-fourth of women and one-sixth of

men experience major depression during their lifetime.^[1] The Global Burden of Disease Study 2017 demonstrated that major depressive disorder (MDD) was the third leading cause of years lived with disability (YLDs) in 2017, and an increase of 14.3%

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(13.1–15.6) in the number of all-age YLDs attributed to depressive disorders was observed from 2007 to 2017.^[2] The lifetime and 12-month prevalence of MDD in China were 3.4% (2.9%–3.9%) and 2.1% (1.8%–2.4%), respectively.^[3] MDD is the most prevalent psychiatric disorder in HIV-positive individuals^[4] and occurs more often in HIV-positive individuals than in HIV-negative individuals.^[5] MDD among HIV-positive individuals can lead to poorer clinical and behavioral outcomes and a decreased quality of life,^[6,7] which goes against the 90–90–90 targets.^[8] Thus, identifying the associated factors that can be targeted for the prevention and treatment of MDD is of paramount public importance.

Living with a chronic and potentially fatal illness, HIV-positive individuals encounter a number of negative life events (NLEs), including HIV-related stigma and discrimination, financial problems, and conflict with families and others.^[9–12] Being HIV-positive or receiving an AIDS diagnosis is also a stressor that people living with HIV face.^[13,14] Previous studies have shown that NLEs reported by HIV-positive individuals were associated with an increased risk of MDD,^[15,16] and there is a dose-response relationship between NLEs and MDD.^[17,18] However, few studies have evaluated the association between MDD and the stress caused by NLEs among HIV-positive individuals, especially in China, although such studies have been conducted among the general population.^[19] Many studies examining the association between stress and depression did not clearly distinguish between acute and chronic stress, although the impact of the 2 types of stress may be different.^[20]

According to the 2015 China AIDS Response Progress Report, there were 501,000 reported people living with HIV around the country by the end of 2014, which accounted for 0.037% (501,000/1567.82 million) of China's total population. Although the national HIV prevalence remains low, the prevalence is high in some areas, including Guangdong Province, which ranked fifth in terms of the highest number of people living with HIV in China.^[21] A total of 49,038 cases of people living with HIV were reported in Guangdong from 2000 to 2013, with an average annual increasing rate of 23.2%.^[22] Thus, we conducted this study to evaluate the association between NLEs and MDD, aiming to provide evidence for the need of tailored interventions addressing mental health among HIV-positive individuals in Guangdong, China.

2. Methods

2.1. Participants

A cross-sectional study was conducted to recruit HIV-positive individuals using a convenience sampling method with the help of the Centers for Disease Prevention and Control (CDCs) of Guangzhou, Zhongshan, and Yangjiang from September 2007 to September 2008. The inclusion criteria were

- (1) HIV-positive,
- (2) aged 18 years and over,
- (3) able to comprehend the study objectives and procedures and to provide written informed consent.

Individuals with debilitating illnesses or hearing or visual impairment were excluded. The sample size was calculated with the average prevalence (P) of MDD among HIV-positive individuals of 0.25,^[23,24] d of 0.2 P , and α of 0.05 using the formula $[N = Z_{\alpha}^2 P(1 - P)/d^2]$. Taking a 10% rate of no response into consideration, the required sample size was 317.

2.2. Data collection

Data on sociodemographics, HIV-related information, and NLEs were collected using a questionnaire in a face-to-face interview.

2.3. NLEs

The 17-item life-event scale used in the current study was developed using items extracted from the 60-item life-event scale developed by the Beijing Suicide Research and Prevention Center^[25] and combined with several HIV-related NLEs because HIV-related NLEs have been suggested as a source of life stress among HIV-positive individuals.^[9–12] The scale included NLEs, such as conflict with spouse or lover, conflict with nonfamily members, conflict among other family members, problems in childbearing, problems in relationships or marriages, problems at work or school, financial problems, physical illness, illness or death of relatives, being abused, drug use, HIV infection, AIDS diagnosis, HIV/AIDS discrimination, sexual partner or family members infected with HIV, and others. For each NLE that had occurred and continued to have a negative psychological effect during the last year, the respondent reported the time when the NLE first occurred, how long the psychological effect lasted, and the magnitude of the psychological effect (from mild to very severe, coded as 1–4). The negative psychological effects were oppression, anxiety, depression, insomnia, bad temper, poor appetite, or unwilling to socialize. The number of NLEs that occurred during the last year and the number of NLEs that continued to have a negative psychological effect were assessed. The products of the duration (in months) and the severity of the psychological effect for each NLE were summed, and the score was considered a measure of chronic stress. The products of the reciprocal of the duration (in months) and the severity for the psychological effect for each NLE were summed and considered a measure of acute stress. Higher scores indicated higher chronic or acute stress, respectively.^[25]

2.4. MDD

The Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition, Text Revision (DSM-IV-TR) Axis I Disorders-Patient Edition (SCID-I/P) based on the DSM-IV criteria was adapted to measure MDD among the participants.^[26] The semistructured diagnostic screening interviews were conducted by 2 licensed clinical psychiatrists who were trained for 2 weeks in the Beijing Suicide Research and Prevention Center and qualified to conduct the SCID independently.

2.5. Statistical analysis

Data analyses were performed using SPSS (version 12.0; SPSS Inc., Chicago, IL). χ^2 tests and Fisher exact tests were conducted to compare the difference in NLEs between individuals with or without MDD. A contingency table was applied to evaluate the linear trend in the prevalence of MDD among the strata of selected variables (number of NLEs in last year, chronic stress and acute stress). Multiple non-conditional logistic regressions were performed to calculate *odds ratios* (ORs) with 95% *confidence interval* (CI) to examine the relationship between NLEs and MDD adjusting for age, sex and the sex-by-age interaction term. All hypothesis tests were 2-tailed with $\alpha=0.05$.

Table 1
Negative life events among 339 HIV-positive individuals in Guangdong, China.

Negative life events	Events that ever occurred	Events that occurred in the last year	Duration of negative psychological impact (days)	Severity of the psychological impact (severe/very severe)	Events still affecting at the moment of the study
	N (%) [*]	N (%) [†]	Median (IQR) [‡]	N (%) [§]	N (%)
HIV infection	223 (65.78)	182 (53.69)	60.00 (24.00–144.00)	158 (70.85)	188 (84.30)
Drug use	138 (40.71)	108 (31.86)	84.00 (36.00–180.00)	83 (60.14)	99 (71.74)
Financial problems	127 (37.46)	121 (35.69)	120.00 (36.00–360.00)	83 (65.35)	100 (78.74)
AIDS diagnosis	83 (24.48)	78 (23.01)	56.00 (18.00–120.00)	52 (62.65)	69 (83.13)
Sexual partner or family members infected with HIV	78 (23.01)	74 (21.83)	60.00 (24.00–127.50)	52 (66.67)	66 (84.62)
Illness or death of relatives	68 (20.06)	27 (7.96)	33.50 (12.00–60.00)	37 (54.41)	55 (80.88)
Problems at work or school	59 (17.40)	56 (16.52)	70.00 (24.00–180.00)	32 (54.24)	49 (83.05)
HIV/AIDS discrimination	53 (15.63)	50 (14.75)	66.00 (24.00–162.00)	29 (54.72)	33 (62.26)
Conflict with spouse or lover	53 (15.63)	26 (7.67)	36.00 (14.00–116.00)	23 (43.40)	33 (62.27)
Conflict with other family members	46 (13.57)	34 (10.03)	38.00 (9.00–84.00)	25 (54.35)	33 (71.74)
Physical illness	40 (11.80)	26 (7.67)	44.00 (12.00–131.50)	21 (52.50)	31 (77.50)
Problems in childbearing	26 (7.67)	21 (6.19)	37.00 (12.75–102.00)	18 (69.23)	22 (84.62)
Problems in relationships or marriages	26 (7.67)	18 (5.31)	30.50 (18.50–91.50)	16 (61.54)	24 (92.31)
Conflict with nonfamily members	13 (3.83)	6 (1.77)	8.00 (3.00–19.50)	7 (53.85)	6 (46.15)
Conflict among other family members	13 (3.83)	6 (1.77)	24.00 (12.00–84.00)	7 (53.85)	4 (30.77)
Being abused	2 (0.59)	1 (0.29)	50.00 ± 19.80 [¶]	2 (100.00)	2 (100.00)

^{*} Number of individuals reporting negative life events that ever occurred divided by the number of HIV-positive individuals.
[†] Number of individuals reporting negative life events that occurred in the last year divided by number of HIV-positive individuals.
[‡] IQR: interquartile ranges.
[§] Number of individuals reporting negative life events that ever occurred with severe/very severe psychological impact divided by number of individuals reporting negative life events that ever occurred.
^{||} Number of individuals reporting negative life events that ever occurred and still have an effect at the moment of the study divided by number of individuals reporting negative life events that ever occurred.
[¶] mean ± standard deviation (SD).

2.6. Ethical considerations

This study was approved by the Ethics Committee of Guangdong Provincial Center for Disease Prevention. Study participants were asked to sign a written informed consent form before participating in the study.

3. Results

3.1. Sociodemographic and HIV-related characteristics

The median age of the 339 participants was 34 (interquartile ranges, IQR: 29–38) years, ranging from 18 to 62. Most of the participants (82.60%, 280/339) were male. The participants had known of their HIV seropositivity for a median duration of 6 months (IQR: 2–38), with a range of 0 to 134, among whom 61 (17.99%) were diagnosed with AIDS. Most of the HIV-positive individuals reported that they were infected through injection drug use (69.91%, 237/339), followed by heterosexual transmission (27.14%, 92/339), and other (2.95%, 10/339).

3.2. NLEs

Among the 339 participants, 306 (90.27%) reported one or more NLEs had ever occurred, and 295 (87.02%) reported 1 or more NLEs in the last year. The 5 most frequently reported NLEs that ever occurred were HIV infection (65.78%), drug use (40.71%), financial problems (37.46%), AIDS diagnosis (24.48%), and sexual partner or family members infected with HIV (23.01%), which were in line with the frequency of NLEs that occurred in the last year. The median duration of the negative psychological impact of NLEs ranged from 8.00 days (IQR: 3.00–19.50) to 120.00 days (36.00–360.00). More than 50% of the individuals reporting NLEs that ever-occurred thought that NLEs had very severe or severe psychological effects, with the exception of

physical illness. More than 50% of the individuals reporting NLEs that ever-occurred thought that the NLEs continued to have an impact at the moment of the study, with the exception of conflict with nonfamily members and among other family members (Table 1).

3.3. The relationship between NLEs and MDD

Among the 339 participants, 41 were diagnosed with MDD, resulting in a prevalence of 12.09% (95% CI: 8.62%–15.57%). Individuals who reported NLEs including HIV infection, financial problems, AIDS diagnosis, HIV/AIDS discrimination, conflict with spouse or lover, conflict with other family members, problems in childbearing, and conflict with nonfamily had a higher prevalence of MDD than those who did not report these NLEs (all $P < .05$). After adjusting for age, sex, and the sex-by-age interaction term, the multiple logistic regression models showed that individuals who reported HIV infection (OR = 3.28, 95% CI: 1.33–8.07), financial problems (OR = 3.08, 95% CI: 1.55–6.14), AIDS diagnosis (OR = 2.86, 95% CI: 1.44–5.67), HIV/AIDS discrimination (OR = 4.38, 95% CI: 2.09–9.19), conflict with spouse or lover (OR = 2.67, 95% CI: 1.24–5.75), conflict with other family members (OR = 4.19, 95% CI: 1.94–9.07), problems in childbearing (OR = 3.38, 95% CI: 1.25–9.14), or conflict with nonfamily (OR = 11.03, 95% CI: 3.43–35.50) were at a higher risk of MDD than those who did not report these NLEs (Table 2).

Individuals who reported more NLEs in the last year had a higher prevalence of MDD ($P < .001$) than those who reported fewer NLEs. The prevalence of MDD increased with the number of NLEs in the last year (P for trend $< .001$). After adjusting for age, sex, and the sex-by-age interaction term, a greater number of NLEs in the last year was associated with a higher risk of MDD (OR = 2.86, 95% CI: 1.76–4.65). Individuals who reported a

Table 2
The relationship between negative life events and major depressive disorder among 339 HIV-positive individuals in Guangdong, China.

Variables	Number of cases (%)	Major depressive disorder		P*	aOR (95%CI) †	P
		Yes (%)	No (%)			
Negative life events						
HIV infection	223 (65.78)	35 (85.37)	188 (63.09)	.005	3.28 (1.33–8.07)	.010
Drug use	138 (40.71)	16 (39.02)	122 (40.94)	.815	0.96 (0.48–1.91)	.909
Financial problems	127 (37.46)	25 (60.98)	102 (34.23)	.001	3.08 (1.55–6.14)	.001
AIDS diagnosis	83 (24.48)	18 (43.90)	65 (21.81)	.002	2.86 (1.44–5.67)	.003
Sexual partner or family members infected with HIV	78 (23.01)	9 (21.95)	69 (23.15)	.864	0.99 (0.44–2.20)	.977
Illness or death of relatives	68 (20.06)	10 (24.39)	58 (19.46)	.460	1.44 (0.66–3.13)	.364
Problems at work or school	59 (17.40)	8 (19.51)	51 (17.11)	.704	1.15 (0.49–2.69)	.755
HIV/AIDS discrimination	53 (15.63)	15 (36.59)	38 (12.75)	<.001	4.38 (2.09–9.19)	<.001
Conflict with spouse or lover	53 (15.63)	12 (29.27)	41 (13.76)	.010	2.67 (1.24–5.75)	.012
Conflict with other family members	46 (13.57)	13 (31.71)	33 (11.07)	<.001	4.19 (1.94–9.07)	<.001
Physical illness	40 (11.80)	7 (17.07)	33 (11.07)	.299‡	1.59 (0.64–3.93)	.319
Problems in childbearing	26 (7.67)	7 (17.07)	19 (6.38)	.026‡	3.38 (1.25–9.14)	.017
Problems in relationships or marriages	26 (7.67)	2 (4.88)	24 (8.05)	.754‡	0.57 (0.13–2.60)	.482
Conflict with nonfamily members	13 (3.83)	7 (17.07)	6 (2.01)	<.001‡	11.03 (3.43–35.50)	<.001
Conflict among other family members	13 (3.83)	0 (0.00)	13 (4.36)	.380‡	–	–
Being abused	2 (0.59)	1 (2.44)	1 (0.34)	.228‡	8.54 (0.52–141.08)	.134
Negative life events characteristics						
Number of negative life events in last year				<.001		<.001
0-	122 (35.99)	4 (9.76)	118 (39.60)		1	
2-	104 (30.68)	12 (29.27)	92 (30.87)		3.56 (1.09–11.57)	.035
≥4	113 (33.33)	25 (60.98)	88 (29.53)		8.93 (2.98–26.82)	<.001
P for trend	–	–	–	<.001	2.86 (1.76–4.65)	<.001
Chronic stress score						
Lowest tertile (≤6.33)	113 (33.3)	1 (2.44)	112 (37.58)	<.001	1	
Middle tertile (6.33-)	113 (33.3)	11 (26.83)	102 (34.23)		11.86 (1.50–93.70)	.019
Highest tertile (≥37.78)	113 (33.3)	29 (70.73)	84 (28.19)		38.22 (5.08–287.45)	<.001
P for trend	–	–	–	<.001	4.36 (2.44–7.78)	<.001
Acute stress score						
Lowest tertile (≤2.60)	113 (33.3)	9 (21.95)	104 (34.90)	.236	1	
Middle tertile (2.60-)	113 (33.3)	17 (41.46)	96 (32.21)		2.13 (0.89–5.07)	.088
Highest tertile (≥10.31)	113 (33.3)	15 (36.59)	98 (32.89)		1.85 (0.76–4.48)	.176
P for trend	–	–	–	.263	1.31 (0.87–1.98)	.197
Total	339 (100.00)	41 (12.09)	298 (87.91)			

* P for chi square test.

† Adjusted for sex, age, the sex-by-age interaction term; aOR: adjusted odds ratio; CI: confidence interval.

‡ Fisher exact test.

higher chronic stress score were associated with a higher prevalence of MDD ($P < .001$). The prevalence of MDD increased with increases in chronic stress scores (P for trend $< .001$). After adjusting for age, sex, and the sex-by-age interaction term, a higher chronic stress score was associated with a higher risk of MDD ($OR = 4.36$, $95\% CI: 2.44–7.78$). However, the acute stress score was not associated with the prevalence of MDD ($P = .236$) or the risk of MDD ($OR = 1.31$, $95\% CI: 0.87–1.98$) after adjusting for age, sex, and the sex-by-age interaction term (Table 2).

4. Discussion

The results of the current study showed that HIV-positive individuals who reported NLEs including HIV infection, financial problems, AIDS diagnosis, HIV/AIDS discrimination, conflict with spouse or lover, conflict with other family members, problems in childbearing, and conflict with nonfamily were at a higher risk of MDD than those who did not report these NLEs. A greater number of NLEs in the last year and a higher chronic stress score were associated with a higher risk of MDD. These results supported the notion that psychosocial adversity was

involved in the development of MDD among HIV-positive individuals in Guangdong, China.

In line with previous studies, NLEs that ever occurred were common among HIV-positive individuals,^[27] and most of these NLEs occurred in the last year. The HIV-positive individuals encountered more NLEs than the HIV-negative individuals or the general population encountered.^[28,29] In addition to NLEs that the general population could encounter, such as financial problems, the other most frequent NLEs were HIV-related issues, which revealed that HIV infection was a major stressor they had encountered.^[13] Moreover, the NLEs that they experienced were very serious, and the impact of the NLEs continued for a long time until the present time, which implied that the impact of NLEs could not be ignored and that more attention should be paid to relieving the stress of NLEs.

HIV-positive individuals with NLEs were more likely to have MDD, which was consistent with previous studies.^[15] The dose-response relationship between NLE exposure and MDD had been reported in general populations^[19,29,30] and HIV-positive individuals.^[17,18] Evidence has also shown a relationship between NLEs and the onset, recurrence and persistence of depression.^[31] NLEs may significantly influence the development

of depressive mood, and the depressive mood can, in turn, precipitate stressful life events.^[32,33] As stressors, NLEs can lead to a negative stress response and contribute to depression, not only through the additive effect of more NLEs but also through the impact of those NLEs producing subsequent stress. Psychological stress can trigger significant increases in inflammatory activity, and increases in inflammation can in turn elicit profound changes in behavior, which include the initiation of depressive symptoms.^[34] Furthermore, if the stress is continued or prolonged, it can have detrimental effects on the body's immune, neuroendocrine and central nervous systems. When chronic stress is untreated, it can play a role in developing major disorders, such as depression.^[35] Stress hormones, such as cortisol, help a person respond to an immediate threat. However, stress hormones could increase anxiety and precipitate MDD if the stress is prolonged.^[36] One prospective study highlighted the importance of stressful life events and chronic distressing conditions on the incidence of major depression,^[37] which was in line with the results of the current study. The acute stress caused by NLEs was not associated with MDD in the current study. One possible explanation was that persistent chronic stress may have a "saturation" effect that reduced the effects of acute stress on depression.^[38] Many traumatized individuals can manage to deal with acute and posttraumatic stress during the following weeks and months unless the process of recovery is interfered by additional adverse psychosocial contexts, psychological disposition or biological vulnerability.^[39] Thus, acute stress does not necessarily lead to mental disorders. Another previous study suggested that decreased brain gray matter volume (GMV) in depressed patients with chronic stress was observed in more brain regions than in patients with acute stress, and GMV alterations were associated with the neural mechanisms of depression.^[40] However, another study had found that the onset of major depressive episodes was associated with both chronic and acute stress.^[20] Prospective studies should be conducted to further investigate the association between acute stress and MDD.

HIV infection and an AIDS diagnosis were stressors associated with an increased risk of MDD among HIV-positive individuals.^[13,14] As a chronic and potentially fatal illness, HIV infection can bring about psychosocial stressors.^[41] AIDS-related symptoms occur as HIV infection progresses to AIDS, which adds more stress for the HIV-positive individuals.^[11,13] One previous study showed that HIV/AIDS discrimination from acquaintances was a main stressor in the daily lives of HIV-positive individuals. Due to fear of discrimination, exclusion by the community members and abandonment, HIV-positive individuals chose not to tell others about their seropositivity.^[9] Discrimination due to their seropositivity may break down psychological resilience in the face of HIV/AIDS,^[42] lead to limited financial resources and a poorer quality of life,^[10] create barriers to disclosure and seeking help,^[43] lead to social isolation and subsequent stress,^[44] and increase the risk of MDD.^[45]

Since HIV is sexually transmitted, HIV-positive individuals encounter affective and sexual relationship difficulties, marital conflicts and even divorces.^[11] Problem in childbearing is another issue that HIV-positive individuals face due to the possible mother-to-child transmission. Social exclusion and disease progression result in conflicts at work and even dismissals that can lead to more serious financial problems.^[10] People with chronic interpersonal conflicts would be particularly vulnerable

to the effects of stress and bring about problems of social isolation, which increase the risk of depression.^[12,46]

Some limitations of this study should be noted. First, the cross-sectional design cannot be used to infer causality between NLEs and MDD. Prospective studies are needed to be conducted to examine the relationship between NLEs and MDD.^[17] Second, the possible selection bias due to a convenience sampling method may limit the representation of the sample and the extrapolation of the results.

5. Conclusions

The results of this study demonstrated that NLEs were common among HIV-positive individuals. HIV-positive individuals who reported NLEs, such as HIV infection, financial problems, AIDS diagnosis, HIV/AIDS discrimination, conflict with spouse or lover, conflict with other family members, problems in childbearing, and conflict with nonfamily were at an increased risk of MDD compared to those who did report these NLEs. A greater number of NLEs and a higher chronic stress score were associated with a higher risk of MDD. Further research is warranted to assess the pathway from NLEs to stress and ultimately to mental disorders. Interventions should be tailored to those who reported NLEs to help reduce the risk of MDD and increase the quality of life among HIV-positive individuals.

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