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Health-Related Quality of Life in HIV-Infected Men Who Have Sex with Men in China: A Cross-Sectional Study

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Statistical Analysis C
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Background: China is undergoing a rapid growth in the human immunodeficiency virus (HIV) epidemic involving men who have sex with men (MSM). Reports about their health-related quality of life (HRQOL) are scarce. This study aimed to assess the HRQOL and factors influencing HIV-positive MSM in a city in the northeast of China.

Material/Methods: A cross-sectional study was conducted in Harbin city (Heilongjiang, China). HIV-positive MSM (n=125) were interviewed using the WHOQOL-HIV-BRIEF scale, the Berger HIV Stigma Scale, and other HIV-related questionnaires from June to August 2013.

Results: Among the 6 dimensions of the HRQOL, HIV-related stigma was negatively associated with psychological (r=–0.316, P=0.0003) and spirituality domains (r=–0.324, P=0.0002). Physician support was positively associated with independence domain (r=0.393, P<0.0001). Hostile mentality was associated with psychological (r=0.479, P<0.0001) and spirituality domains (r=0.431, P<0.0001). Adverse effects of HAART were significantly correlated with physical (r=–0.542, P<0.0001) and psychological (r=–0.554, P<0.0001) domains. Multiple logistic regression showed that stigma (odds ratio (OR)=1.251, 95% confidence interval (95%CI): 1.088–1.439, P=0.002) and adverse effects of HAART (OR=1.117, 95%CI: 1.069–1.167, P<0.0001) were independent risk factors for low HRQOL. Physician support (OR=0.961, 95%CI: 0.941–0.982, P=0.0002) and CD4+ counts >350 (OR=0.033, 95%CI: 0.005–0.208, P=0.001) were independent protective factors in MSM receiving HAART. Hostile mentality (OR=0.936, 95%CI: 0.906–0.967, P<0.0001) was an independent protective factor of HRQOL in MSM not receiving HAART.

Conclusions: Psychological factors such as HIV-related stigma, hostile mentality, and physician support have a significant effect on HRQOL in MSM. These findings suggest specific psychological interventions to improve HRQOL in HIV-positive MSM in China.

MeSH Keywords: China • Homosexuality • Psychology • Quality of Life

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Background

In the past 2 decades, the prevalence of human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) has increased rapidly in China. Indeed, according to the 2014 China AIDS Response Progress Report [1], the proportion of reported HIV infections acquired through sexual transmission has increased on a yearly basis, from 33.1% in 2006 to 90.8% in 2013. The proportion of cases arising from homosexual transmission increased from 2.5% in 2006 to 21.4% in 2013 [2]. According to a recent prospective cohort study, the prevalence of HIV among men having sex with men (MSM) in Harbin city increased from 1.0% in 2006 to 7.5% in 2010 [3]. Another study also conducted in this locality in 2011 showed that the prevalence of HIV among MSM reached 9.5% [4].

With the benefits of highly active antiretroviral therapy (HAART), HIV/AIDS has become a chronic and controllable disease. However, HAART and the disease itself are associated with a number of symptoms and adverse effects that have to be endured by the patients [5]. Therefore, HRQOL of HIV-infected patients has become a serious issue for medical staff and patients.

MSM are still regarded as deviating from social morals by Chinese society. HIV-positive MSM may endure more stress, not only due to HIV infection, but also to the stigma and discrimination from society and family [6].With the development of a multicultural society and increasing levels of education, especially the emergence and development of the Internet, privacy and sexual orientation are protected and tolerated in China. Homosexuality is no longer considered a mental illness. Homosexuals can face their sexual orientation and an objective view is taken of their gay identity. Gay men have formed their own communication network and communities. However, homosexuals cannot get a legal marriage license; they can choose to live together with their sexual partners, but this relationship is without legal protection. In addition, most MSM choose to marry heterosexuals to hide their identity. So stigma and discrimination remain a serious problem faced by MSM in China [7]. Therefore, they often hide their real sexual orientation and rarely access healthcare for necessary services [8–10]. It was reported that HIV-related stigma creates social distance that segregates HIV patients from social interaction and support, which seriously weakens the source of psychological support [11]. HIV-positive MSM often hide their real identity and are socially isolated, experiencing multiple negative emotions [10,12], all of which may lead to depression and poor spiritual status.

MSM are more prone to be infected with HIV because of various behavioral risk factors [13–16]. They have been the target of increased attention from Chinese researchers in recent years because of the escalating HIV epidemic in China. However, few studies have paid close attention to the health-related quality of life (HRQOL) of HIV-positive MSM in northeast China. To fill this gap, the present study aimed to investigate the potential factors affecting HRQOL, in an attempt to develop effective care and interventions in this specific population.

Material and Methods

Study design

This was a single-center, cross-sectional study conducted at the Department of Infectious Diseases, Fourth Affiliated Hospital of Harbin Medical University in Harbin, a city in northeast China, from June to August 2013. All HIV-infected MSM were confirmed at the Harbin Center for Disease Control and Prevention. Patients were selected using the method of convenience sampling. Patients were recruited during their regular clinic visits by trained investigators – 2 doctors with MD degrees and 5 years of related work experience. All data and samples were anonymized. The present study was approved by the Medical Research Ethics Committee of Harbin Medical University. All participants provided written informed consent.

Participants

The survey involved HIV-infected patients, including those on HAART. HIV infection diagnosis was confirmed by Western blot prior to the start of the survey. The patients were classed as being diagnosed according to the following 3 categories. Voluntary: the subject voluntarily underwent HIV testing, not for concern over behavior or other reasons. Health check: HIV infection was found when a health check was conducted and HIV testing confirmed the diagnosis. High risk behavior or others: the subject underwent testing due to their high risk behavior or for other reasons in their past.

Patients were selected for inclusion from all of those that attended the clinic during the recruitment period and undertook the initial questionnaire relating to their HIV infection status. The inclusion criteria were: 1) self-reported homosexual behavior in the past 6 months as identified as a possible cause for HIV infection in the study questionnaire and 2) ≥18 years old. Exclusion criteria were: 1) cognitive impairment or other mental disorders or 2) active opportunistic infections or chronic conditions that could potentially affect QOL, such as diabetes, high blood pressure, and hepatic or renal dysfunction as identified through the patients' medical records.

Data collection

The questionnaires used in this study was translated into English and are included in the Supplementary Material. MSM

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were assessed using a structured questionnaire about HRQOL, HIV-related stigma, adverse effects of HAART, hostile mentality, medical expense concerns, and physician support. Hostile mentality was defined as social discrimination that could impact many aspects of the HIV-infected patient's life; this might be in the form of concern over future treatment and life that could also produce potential psychological hostility to others, even resulting in antisocial actions by HIV-infected patients. Quality of life (QOL) was evaluated using the established WHOQOL-HIV BREF scale [17,18] using a validated Chinese version [19,20]. It contains 31 items involving 6 specific dimensions of HRQOL, including physical and psychological, independence, social relationships, environment, and spirituality. The first 2 items were used to assess the patient's general health status. Each item was scored from 1 to 5, with higher scores indicating better QOL. Scores of each dimension were transformed into a centesimal system. If the total score obtained by an individual exceeded 60, it reflected a better QOL (Cronbach's alpha was 0.78). This cutoff value was used in the binary logistic regression analyses.

HIV-related stigma was evaluated using a validated Chinese version of the Berger HIV Stigma Scale [21]. In order to elicit an active response from the MSM population, we simplified the scale to 20 items after consultation with the experts who validated the version. Responses were scored as 1 point (if disagree) and 2 points (if agree), with the total score ranging from 20 to 40 points. Higher scores denoted higher perceived stigma. Cronbach's alpha was 0.83.

Adverse effects of HAART were evaluated using the Symptoms Scale, which was created by the AIDS clinical trials group (ACTG) [22] using a Chinese validated version [23]. It contains 20 items, with each item assigned a score ranging from 0 ("no symptom") to 4 ("seriously distressing symptoms"), and the total score ranges from 0 to 80. A higher score indicates more serious adverse effects of HIV treatment. Cronbach's alpha was 0.92.

Scales assessing hostile mentality, medical expense concerns, and physician support were used as potential influencing factors of HRQOL, which were generated from the Quality Of Life Scale adapted for Chinese people living with HIV/AIDS [24]. The domains of hostile mentality, medical expense concerns, and physician support included 6, 3, and 2 items, respectively, which were used to assess individual feelings within the past 2 weeks. Each item was scored from 1 to 5 points, where 1 indicates "all the time", and 5 indicates "never". For example, for an item asking: "how many times have you felt abandoned by society", the available responses were: 1 (all the time), 2 (most of the time), 3 (part of the time), 4 (a few times), and 5 (never). Hostile mentality and medical expense concerns were negatively scored, with a higher score indicating less hostility and concerns about HIV treatment expense. Physician support was scored positively. Scores of each dimension were transformed to centesimal outcomes using the following formula: centesimal score = (actual score-minimum score)/range of scores*100. Cronbach's alpha values were 0.70, 0.89, and 0.89, respectively.

All participants were individually interviewed in a private room. Patients with sufficient education filled in the questionnaire themselves. For patients with low education, the completion of the questionnaires was assisted by the investigators through interviewing.

Statistical analysis

Epidata 3.02 was used to establish the database. Continuous variables are presented as mean ± standard deviations (SD) (normally distributed) or as median and range (non-normally distributed), and were analyzed using ANOVA with the LSD post hoc test or the Mann-Whitney test, respectively. Categorical data are presented as frequencies, and were analyzed using the chi-square test or the Fisher's exact test, as appropriate. HRQOL scores were compared by t-test. Stepwise multiple logistic models were created using variables that were associated with P-values <0.10 in univariate analyses. SAS 9.2 (SAS Institute Inc., Cary, NC, USA) was used for statistical analyses. Two-tailed P-values <0.05 were considered statistically significant.

Results

Characteristics of the patients

In total, 215 patients were identified during the recruitment process, and of these, 183 provided details in the initial questionnaire allowing them to be considered for inclusion in the study. Five patients were then excluded for meeting the exclusion criteria. Forty-nine patients were not eligible for inclusion because they did not self-report as homosexual behavior being a reason for HIV infection. Among the 129 eligible HIV-positive MSM, only 4 declined to participate or failed to complete the questionnaires; therefore, the response rate was 96.7% (n=125). Among the 125 patients, the majority were aged ≤30 years (48.0%), single (70.4%), had university-level education or above (42.4%), and employed (45.6%). Among 123 patients (2 patients had no CD4 testing), 28.8% had a CD4 count >350. Among 125 patients, 48.8% of MSM received their HIV diagnosis through voluntary HIV testing. Characteristics of the patients are summarized in Table 1.

Health-related quality of life

Among the 125 respondents, MSM aged 31–40 years exhibited relatively higher scores for independence (P=0.026). MSM

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Table 1. Clinical and demographic data of the 125 HIV-infected MSM.

	N	%
Age/years		
≤30	60	48.0
31–40	37	29.6
>41	28	22.4
Median age (range)	30.7 (19 to 67)	
Marital status		
Single	88	70.4
Married	17	13.6
Divorced/widowed	20	16
Education		
Primary or illiteracy	3	2.4
Junior or senior high school	69	55.2
University or above	53	42.4
Income (RBM)		
<1000	40	32.0
1000–3000	68	54.4
≥3000	17	13.6
Occupation		
Employed	57	45.6
Unemployed	30	24
Others	38	30.4
Antiretroviral therapy		
Yes (either receiving or had previous received)	55	44.0
No therapy received to date	70	56.0
CD4+ counts*		
<100	14	11.2
100–350	73	58.4
≥350	36	28.8
HIV testing reason		
Voluntary	61	48.8
Health check	22	17.6
High risk behavior or others	42	33.6
HRQOL scores, mean ±SD (HAART *vs.* No HAART)	78.8±12.0 (79.2±12.0 *vs.* 78.4±12.1, P=0.94)	
Stigma	32.1±4.4 (32.9 ±4.0 *vs.* 31.4 ±4.7, P=0.05)	
Adverse effects of HAART	17.7±14.9	
Hostile mentality	88.4±13.8 (88.0 ±13.0 *vs.* 88.8 ±14.5, P=0.75)	
Medical expense concern	47.5±30.7 (48.2 ±29.0 *vs.* 47.0 ±32.1, P= 0.84)	
Physician support	52±26.2 (50.6 ±25.9 *vs.* 53.1 ±26.5, P=0.59)	

* CD4 count was unavailable for two patients. HIV – human immunodeficiency virus; HRQOL – health-related quality of life; HAART – highly-active antiretroviral therapy. HRQOL scores were compared by t-test to give P values.

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Table 2. Scores for each dimension of HRQOL according to the demographic characteristics of HIV-positive MSM.

	Domains											
	Physical		Psychological		Independence		Relationship		Environment		Spirituality	
	Mean±SD	P	Mean ±SD	P	Mean ±SD	P	Mean ±SD	P	Mean ±SD	P	Mean ±SD	P
Age												
≤30	13.5±2.4	0.148	12.9±3.0	0.842	13.7±2.7*	**0.026**	12.4±3.0	0.378	11.5±2.3	0.199	13.1±3.4	0.3482
31–40	14.6±2.6		13.2±2.5		15.2±2.5*		12.9±2.3		12.0±2.4		13.2±3.4	
>41	13.9±3.3		12.9±2.2		14.4±2.4		12.0±1.9		12.3±2.0		14.2±3.5	
Marital status												
Single	13.7±2.7	0.434	13.1±2.8	0.724	14.2±2.7	0.637	12.6±2.6	0.304	11.7±2.3	0.528	13.4±3.4	0.406
Married	14.2±2.9		12.6±2.1		14.1±3.1		12.4±3.0		12.1±2.4		12.5±3.4	
Divorced/ widowed	14.5±2.7		12.8±2.7		14.8±2.1		11.7±1.9		12.3±2.3		14.0±3.7	
Education												
Primary or illiteracy	17.0±1.7	0.087	14.1±2.4	0.330	15.3±1.5	0.743	10.7±3.5	0.466	12.0±2.5	0.272	14.3±4.5	0.244
Junior or senior high school	14.0±2.7		12.7±2.8		14.2±2.7		12.4±2.4		11.5±2.1		13.8 ±3.7	
University or above	13.6±2.7		13.3±2.5		14.4±2.6		12.6±2.8		12.2±2.5		12.8±3.1	
Income (RMB)												
<1000	13.6±2.9	0.613	12.8±3.0	0.476	13.7±2.5	0.165	12.2±2.3	0.816	11.6±2.2	0.653	13.1±3.8	0.559
1000–3000	13.9±2.4		12.9±2.2		14.5±2.6		12.5±2.8		11.9±2.3		13.3±3.4	
≥3000	14.4±3.4		13.7±3.3		14.9±2.7		12.6±2.6		12.1±2.6		14.2±2.8	
Occupation												
Employed	14.1±2.6	0.695	13.3±2.6	0.177	14.7±2.7	0.059	12.4±2.5	0.862	11.9±2.2	**0.048**	13.3±3.3	0.884
Unemployed	13.5±2.8		12.2±2.6		13.3±2.7		12.4±2.9		11.0±2.5*		13.1±3.8	
Others	13.9±2.8		13.2±2.7		14.4±2.3		12.6±2.5		12.3±2.0*		13.6±3.5	
Antiretroviral therapy												
Yes	14.0±2.8	0.682	13.2±2.4	0.356	14.2±2.5	0.697	12.6±2.4	0.589	11.8±2.2	0.979	13.4±3.3	0.850
No	13.8±2.7		12.8±2.9		14.4±2.7		12.3±2.7		11.8±2.3		13.3±3.6	
CD4+ counts												
<100	13.2±3.1	0.172	12.8±2.8	0.696	13.2±2.4	0.219	11.1±2.1	0.125	10.8±2.3*	**0.034**	12.1±3.1	0.315
100–350	13.7±2.7		13.2±2.5		14.4±2.5		12.7±2.4		12.3±2.4*		13.4±3.7	
≥350	14.6±2.5		12.8±2.9		14.6±2.9		12.6±3.1		11.4±2.0		13.7±3.1	
HIV testing reason												
Voluntary	14.5±2.8*	**0.029**	13.4±2.4	0.210	14.8±2.7*	**0.029**	12.6±2.2	0.412	12.3±2.2	0.106	14.0±3.4	0.082
Health check	13.7±2.1		12.4±2.6		13.1±2.2*		11.8±2.6		11.5±2.1		13.0±3.4	
High risk behavior/ others	13.1±2.7*		12.7±3.1		14.1±2.6		12.5±3.0		11.3±2.4		12.5±3.4	

* P<0.05 between these two groups, post hoc least significant difference (LSD) test. HIV – human immunodeficiency virus.

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Table 3. Correlations of psychological factors and HRQOL dimensions in HIV-positive MSM.

	Domains											
	Physical		Psychological		Independence		Relationship		Environment		Spirituality	
	r	p	r	p	r	p	r	p	r	p	r	p
Stigma	–0.175	0.051	–0.316	0.0003	–0.177	**0.048**	–0.199	**0.026**	0.026	0.959	–0.324	**0.0002**
Adverse effects of HAART (N=55)	–0.542	**<0.0001**	–0.554	**<0.0001**	–0.510	**0.0001**	–0.408	**0.003**	–0.475	**0.0004**	–0.448	**0.001**
Hostile mentality	0.391	**<0.0001**	0.479	**<0.0001**	0.378	**<0.0001**	0.188	**0.036**	0.248	**0.005**	0.431	**<0.0001**
Medical expense concern	0.080	0.378	0.006	0.948	0.079	0.379	–0.021	0.817	0.296	**0.001**	0.132	0.144
Physician support	0.329	**0.0002**	0.310	**0.0004**	0.393	**<0.0001**	0.307	**0.001**	0.237	**0.008**	0.210	**0.019**

Pearson's correlations. HAART – highly-active antiretroviral therapy.

who were employed had higher scores for independence and environment domains (P=0.059 and 0.048, respectively). Those who were voluntarily tested for HIV had higher scores for physical health and independence (P=0.029 and 0.029, respectively) (Table 2).

HIV-related stigma was negatively correlated with psychological (r=–0.316, P=0.0003), independence (r=–0.177, P=0.048), relationship (r=–0.199, P=0.026), and spiritual (r=–0.324, P=0.0002) domains. Adverse effects of HAART were negatively correlated with physical (r=–0.542, P<0.0001), psychological (r=–0.554, P<0.0001), independence (r=-0.510, P=0.0001), relationship (r=–0.408, P=0.003), environment (r=–0.475, P=0.0004), and spirituality (r=–0.448, P=0.001) domains. Hostile mentality was positively associated with physical (r=0.391, P<0.0001), psychological (r=0.479, P<0.0001), independence (r=0.378, P<0.0001), relationship (r=0.188, P=0.036), environment (r=0.248, P=0.005), and spirituality (r=0.431, P<0.0001) domains. Medical expenses were correlated with the environment domain (r=0.296, P=0.001). Physician support was significantly associated with physical (r=0.329, P=0.0002), psychological (r=0.310, P=0.0004), independence (r=0.393, P<0.0001), relationship (r=0.307, P=0.001), environment (r=0.237, P=0.008), and spirituality (r=0.210, P=0.019) domains (all Pearson's correlations; Table 3).

Multivariate analysis

After adjustment for confounders, multiple logistic regression analysis showed that CD4+ count >350 was a positive independent factor of overall HRQOL compared with those with CD4+ counts <350 (OR=0.033, P=0.001) among MSM who were receiving HAART treatment. In addition, physician support was also a protective factor for overall HRQOL (OR=0.961, P=0.0002). However, stigma and adverse effects of HAART were both risk factors for overall HRQOL (OR=1.251 and 1.117, P=0.002 and <0.0001, respectively). Among MSM without HAART, hostility was negatively associated with overall HRQOL (OR=0.936, P<0.0001), indicating that HIV-positive MSM with high hostile mentality had poor HRQOL (Table 4).

Model 1 was adjusted for age, marital status, education level, income, occupation, CD4+ counts, HIV testing reason, stigma, adverse effects of HAART, hostile mentality, medical expense concern, and physician support.

Model 2 was adjusted for age, marital status, education level, income, occupation, CD4+ counts, HIV testing reason, stigma, hostile mentality, medical expense concern, and physician support.

Discussion

The aim of the present study was to assess the HRQOL and influencing factors in HIV-positive MSM in city in northeastern China. Results showed that among the 6 dimensions of HRQOL, HIV-related stigma was negatively associated with the psychological and spirituality domains. Physician support was positively associated with the independence domain. Hostile mentality was associated with the psychological and spirituality domains. Adverse effects of HAART were significantly correlated with physical and psychological domains. Multiple logistic regression showed that stigma and adverse effects of HAART

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Table 4. Multiple logistic regression analysis of factors associated with overall HRQOL in MSM with and without HAART.

	OR	95%CI		P
Model 1: with HAART (N=55)				
CD4+ count				
<100	1.000			0.001
100–350	0.298	0.082	1.083	
≥350	0.033	0.005	0.208	
Stigma	1.251	1.088	1.439	0.002
Adverse effects of HAART	1.117	1.069	1.167	<0.0001
Support to doctor	0.961	0.941	0.982	0.0002
Model 2: no HAART (N=70)				
Hostile mentality	0.936	0.906	0.967	<0.0001

were independent risk factors for low HRQOL. Physician support and CD4+ counts >350 were independent protective factors in MSM receiving HAART. Hostile mentality was an independent protective factor of HRQOL in MSM not receiving HAART.

To the best of our knowledge, this is the first report on QOL of MSM living with HIV/AIDS in a northeastern city of China. It has been reported that multiple factors affect HRQOL in HIV-infected patients [24–26], but the correlations between psychological factors and HRQOL have received little research attention, especially in HIV-positive Chinese MSM. The present study showed that the proportion of MSM undergoing voluntary HIV testing was relatively high (48.8%). Moreover, voluntary testers seemingly exhibited a higher score in physical and independence domains than other HIV-tested patients, which might be explained by the voluntary testers having a higher level of education and being younger (people with a college education or above accounted for 51% of those patients less than 30 years old); therefore, they have higher scores in physical and independence domains than other HIV-tested patients.

Multiple regression analysis showed that adverse effects of HAART were a risk factor associated with overall HRQOL. HAART plays a very important role in reducing opportunistic infections and AIDS-related mortality, thus improving patients' self-reported HRQOL [28]. However, adverse effects of HAART seriously affect physical and emotional QOL [5], leading to non-adherence to antiretroviral therapy [29]. In addition, HIV-related stigma was another risk factor for overall HRQOL in MSM undergoing HAART. Indeed, MSM undergoing HAART in medical institutions will inevitably disclose their true sexual orientations, which may result in stigma and discrimination. Our findings suggest that stigma was significantly negatively correlated with psychological and spiritual domains, irrespective of HIV treatment. Low self-esteem and increased high-risk behaviors, such as sexual aggression and drug or alcohol abuse, often result in poor HRQOL [9,16]. Moreover, stigma can mediate the relationship between self-efficacy and medication adherence. HAART adherence is associated with immunological recovery in HIV-infected patients [30], and effective adherence contributes to better QOL among HIV-infected patients [31].

CD4+ count is another significant indicator in improving overall HRQOL in patients under HIV treatment [32,33]. In the present study, CD4+ counts were not associated with HRQOL among MSM without HAART. MSM with lower CD4+ levels underwent antiretroviral therapy, because intervention is provided only when a patient's CD4+ levels are too low. CD4+ count is an important clinical indicator for improving overall HRQOL among MSM who were receiving HAART [34].

A previous study has highlighted the important role of professional training for doctors, nurses, social workers, and peer educators to emphasize social support as a resource for patient autonomy and to fight against discrimination and stigmatization of people living with HIV and AIDS [35]. In the present study, physician support was another positive factor associated with overall HRQOL, which was mainly associated with the independence domain of HRQOL in this study. Physician trust and support is important in establishing a good doctor-patient relationship and effective intervention, especially for the MSM population.

Results of the present study showed that hostile mentality, defined as social discrimination in this study, had a close relationship with psychological and spiritual domains, which also affected the overall HRQOL of MSM who were receiving HAART. Indeed, hostile mentality can isolate HIV-infected MSM from the general community, and may result in reduced QOL in the psychological and spirituality domains. Conversely, MSM undergoing HAART could receive spiritual solace from medical staff, thus weakening its adverse effect on HRQOL following

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treatment. HIV/AIDS programs should be sensitive to the issue of relieving and eliminating hostile psychology to provide MSM patients equal health services and adequate esteem to improve their HRQOL.

It was reported that medical expenses had a negative influence on HRQOL [36]. However, no obvious relationship was found between medical expenses and HRQOL in the present study except for the environment domain, which may be due to free HAART being available for eligible HIV-infected patients provided by the Chinese government in recent years.

Stigma and discrimination related to homosexual activities are major barriers for MSM seeking health services in China [6]. In addition to physical health, psychological and mental health should be the focus of attention. HRQOL is an important measurable outcome that will ultimately influence HIV-related morbidity and mortality. In addition, it plays a vital role in alleviating financial burden and providing cost-effective healthcare. We hope that our findings will raise the concern for better QOL in MSM living with HIV/AIDS, help guide treatment decisions for clinicians to improve HRQOL for HIV-positive MSM, and enable policy interventions targeting MSM.

The present study is not without limitations. Indeed, the sample size was small. The cross-sectional nature of the study prevented us from speculating on the consistency of the relationship between the significant factors affecting HRQOL over time. Other possible factors, such as stage of disease, duration of treatment, and medication adherence, were not analyzed due to the complexity of the survey questionnaire. However, the present study still explored a few novel HRQOL-related factors for HIV-infected MSM and the results may serve as a reference for HIV/AIDS studies in the future. Unfortunately, alcohol and illegal drug use data were not collected, so we cannot assume that all subject in the study were infected with HIV via homosexual behavior. The findings draw attention to HIV-positive MSM, warranting appropriate psychological intervention from a medical and social perspective. However, additional studies in other parts of China are necessary before generalizing these results to the entire Chinese population of MSM.

Conclusions

The present study is the first to report on the HRQOL of HIV-positive MSM in northeastern China. Psychological factors, such as HIV-related stigma, hostile mentality, and physician trust and support, have significant effects on HRQOL in MSM. Appropriate psychological interventions should be provided for HIV-positive MSM to improve their HRQOL.

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Conflict of interest

The authors declare that they have no conflict of interest.

Supplementary Material

Questionnaire

Part I The general data of the population

1. Your birthday: ___Year___ Month__ Day
2. Sex: (1) Male (2) Female
3. Ethnicity: (1) Han (2)___ Other ethnic background
4. Do you have religious belief? (1) Yes (2) No
5. Your marital status:
(1) Unmarried (2) Married (3) Divorced (4) Widowed (5) ___Others
6. Your education level: (1) Illiterate (2) Elementary school
(3) Junior school (4) High school/technical secondary school (5) Graduate (College) and above
7. Family monthly income per person (yuan): (1) <1000 (2) 1000–2000 (3) 2000–3000 (4) >3000
8. The occupation you are engaged in:
(1) Farmer (2) Laborer (3) Unemployed (4) Individual labor (5) Student (6) Work in entertainment venues (bars, barber shops, hotels, etc.) (7) Government institutions, enterprise and public institution (8) Businessman (9) Driver (10) ___ Others

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9. The reason why you accepted HIV virus antibody test:
(1) Have the history of high-risk behavior (paid blood, blood Recipient, intravenous drug abuse, and have had sexual relations with commercial sex workers, family member has AIDS)(2) Feel uncomfortable (3) General survey found by medical staff (4) Voluntary counseling and testing (5)___ Others

10. By which means were you infected
(1) Homosexual behavior (2) Heterosexual behavior (3)Intravenous drug use (4) Blood/ blood produce (5) Mother-to-fetus transmission (6) ____ Others

11. Have you ever been hospitalized for infection with this virus? (1) Yes (2) No

12. CD4 cell count at the most recent test.
(1) <100 (2) 100–350 (3) >350

13. So far, how long have you taken antiretroviral medicines?
(1) From 1 month to 3 months (2) From 3 months to 6 months (3) From 6 months to 1 year (4) More than 1 years

Part II Berger-HIV scale

The following questions are about your social and emotional problems relating to AIDS. Please give your opinion. (Please tick "√" in the appropriate answer options)

Question below:	Disagree	Agree
1. I feel guilty because of HIV infection.	1	2
2. I'll try to keep the secret of my HIV infection.	1	2
3. I think I am not as good as other people, because I am infected by HIV virus.	1	2
4. I am never ashamed of HIV infection.	1	2
5. I would rather not make new friends, to avoid telling others that I am infected by HIV virus.	1	2
6. Most people believe that people living with HIV are annoying.	1	2
7. I consider very carefully whether I should reveal my HIV status to others	1	2
8. Some people who have known that I am infected with HIV have alienated me further.	1	2
9. Since I discovered that I am infected with the HIV virus, I have been worried that people will discriminate against me.	1	2
10. The majority of people will feel uncomfortable when they are surrounded by HIV infected persons.	1	2
11. I feel no need to hide the fact that I was HIV-infected persons	1	2

In the many parts of the following section, the items are supposed that you have told others that you are infected with HIV. That may not be the truth. If the thing referred in item did not really occur in real events, then please suppose that you were in that situation. Please choose the appropriate answers according your consideration and the response of other patients which you think they should have.

	Disagree	Agree
12. I am worried about that the person who knows my situation will tell others.	1	2
13. I regret that I have told others I am infected with the HIV virus.	1	2
14. Once people know that I am infected with HIV, they are always very scared, always avoid contact with me.	1	2
15. Once people know that I am infected with HIV, they do not want me close to their children.	1	2
16. People know that I am infected with HIV, and they are away from me naturally.	1	2

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17. Because of the responses to my HIV infection in some people, I have interrupted my social interaction with them.	1	2
18. I lost friends because I have told them the truth.	1	2
19. I have told my closest person to keep the secret of my HIV infection for me.	1	2
20. The people who know that I am infected by HIV virus are always trying to obliterate my strengths (virtues).	1	2

Part III General social / psychological factors

The following questions are about your conditions in the recent two weeks. (Please tick "√" in the appropriate answer options)

Hostility mentality trends					
1. Give up on themselves, write oneself off as hopeless and act recklessly	1	2	3	4	5
2. Hate of and hostile to the outside world	1	2	3	4	5
3. Want to kill the person who transmitted to you.	1	2	3	4	5
4. Feel that your HIV infection is a social responsibility.	1	2	3	4	5
5. Feel that you are abandoned by the society.	1	2	3	4	5
6. Has impulsion to take revenge on society	1	2	3	4	5
Worried about the economic situation					
1. Worry about not being able to have a fixed income	1	2	3	4	5
2. Worried about future treatment expenses	1	2	3	4	5
3. Because of little money that you cannot live in your own way.	1	2	3	4	5
Physician's support					
1. Confidence in the ability of doctors	1	2	3	4	5
2. I think doctors are very concerned about my own situation.	1	2	3	4	5

Part IV WHOQOL-HIV BREF

We want to know your points of views on living conditions in the past two weeks.

Please read each question and based on your experience, choose the most suitable answer according to your situation.

	Very poor	Poor	Just so so	Good	Very Good
How do you assess your quality of life?	1	2	3	4	5
	Very dissatisfied	**dissatisfied**	**Just so so**	**satisfied**	**very satisfied**
Are you satisfied with your health status?	1	2	3	4	5

The following questions are about the feelings that you experienced in the past two weeks.

	No	Somewhat	Moderate	Very	Extreme
Do you feel that pain will prevent you from doing what you need to do?	1	2	3	4	5

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Are you troubled by related questions about HIV infection physiological problems?	1	2	3	4	5
Does your daily life rely on medical help?	1	2	3	4	5
Do you think your life is fun?	1	2	3	4	5
Do you think your life is meaningful?	1	2	3	4	5
Are you confused about others criticisms about your HIV infection?	1	2	3	4	5
Are you fearful of future?	1	2	3	4	5
Are you fearful of death?	1	2	3	4	5
Can you focus your attention?	1	2	3	4	5
Do you feel safe in your daily life?	1	2	3	4	5
Are your living environments good for your health?	1	2	3	4	5

The following questions are about the ability of your doing something in the past two weeks.

	No	Somewhat	Moderate	Mostly have	Entirely have
Do you have plenty of energy to cope with everyday life?	1	2	3	4	5
Are you satisfied with your appearance?	1	2	3	4	5
Do you have enough money?	1	2	3	4	5
Do you think that people who know you accept you?	1	2	3	4	5
In everyday life, is the information you need in place?	1	2	3	4	5
Do you have the opportunity to do leisure activities?	1	2	3	4	5
	Very poor	**Poor**	**General**	**Good**	**Very good**
How is your activity capability?	1	2	3	4	5

The following questions are about the satisfactory degree of daily life in every aspect during the last two weeks.

	Very dissatisfied	Dissatisfied	Just so so	Satisfied	Ver satisfied
Are you satisfied with your sleeping?	1	2	3	4	5
Are you satisfied with your ability for daily life?	1	2	3	4	5
Are you satisfied with your ability to work?	1	2	3	4	5
Are you satisfied with yourself?	1	2	3	4	5
Are you satisfied with your interpersonal relationships?	1	2	3	4	5
Are you satisfied with your sexual life?	1	2	3	4	5
Are you satisfied with your support from friends?	1	2	3	4	5
Are you satisfied with your living conditions?	1	2	3	4	5
Are you satisfied with the convenience of obtaining health care services?	1	2	3	4	5
Are you satisfied with your transportation?	1	2	3	4	5

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The following questions are about the frequency of certain things experienced in the past two weeks.

	No	Occasionally	Sometimes	Often	Always
Do you have negative feelings? Such as feeling down, despair, anxiety, depression.	1	2	3	4	5

Thank you for your cooperation!

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