The relationship of social support, mental health, and health-related quality of life in human immunodeficiency virus-positive men who have sex with men

From the analysis of canonical correlation and structural equation model: A cross-sectional study

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Abstract

The objective of this study was to reveal the relationships of mental health, social support, health-related quality of life (HRQOL) as well as their dimensions in HIV-positive men who have sex with men (MSM).

HIV-positive MSM were interviewed by a cross-sectional study design using the world Health Organization quality of life bref scale, social support rating scale, and self-rated anxiety and depression scales. Canonical correlation analysis and structural equation model (SEM) were utilized to analyze to the collected data.

Three first pair of canonical variables that was statistically significant ($P < .0001$) and verified could account for the largest cumulative proportion were computed from canonical correlation analysis. The results showed, among the dimensions, depression and anxiety were negatively correlated with support utilization and physical health, while subjective support and support utilization were positively correlation with social relationship health. Structural equation model results showed that support utilization (0.632, $T = 10.44$), depression (0.816, $T = 20.37$), and environmental dimension (0.833, $T = 38.47$) had the largest standardized factor loading in social support, mental health, and HRQOL. The structural coefficient between social support and mental health was -0.433 ($T = -5.88$), between mental health and HRQOL was -0.592 ($T = -10.33$), between social support and HRQOL was 0.290 ($T = 4.10$), indicated social support not only exerted a direct influence, but also mediated mental health to have an indirect effect on HRQOL for HIV-positive MSM.

Environmental dimension is the foremost factor of HRQOL for HIV-positive MSM. Alleviating anxiety symptoms maybe improve physical health, while promoting the support utilization is an effective measure of alleviating depression and improving social relationship health for this special group.

Abbreviations: AGFI = adjusted for degrees of freedom, AIDS = acquired immune deficiency syndrome, GFI = goodness of fit index, HIV = human immunodeficiency virus, HRQOL = health-related quality of life, MSM = men who have sex with men, RMSEA = root mean square error of approximation, RMSR = root mean square residual, SAS = self-rating anxiety scale, SDS = self-rating depression scale, SEM = structural equation model, SSRS = social support rating scale, WHOQOL = world health organization quality of life.

Keywords: men who have sex with men, mental health, quality of life, social support

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1. Introduction

Acquired immune deficiency syndrome (AIDS) has become a significant global public health issue. According to the annual report of China, there are 501,000 people living with human immunodeficiency virus (HIV) or AIDS (296,000 people living with HIV and 205,000 AIDS patients) and there were 159,000 deaths nationwide by the end of 2014, the reported number of people living with HIV and AIDS continues to increase, sexual transmission is the primary mode of transmitting HIV, and the prevalence of HIV in men who have sex with men (MSM) has increased rapidly in China. From a national perspective, the percentage of infections transmitted through MSM increased from 2.5% in 2006 to 25.8% in 2014, the percentage of MSM living with HIV has followed a marked upward trend compared with other high-risk HIV groups.[1,2]

Fortunately, AIDS has become a manageable chronic disease due to the efficacy of highly active anti-retroviral therapy. HIV/AIDS patients can survive long-term, but at present cannot be cured completely. Thus, the overall health state of HIV/AIDS patients has become a common concern for society as a whole. Like other countries worldwide, the stigma and discrimination of HIV/AIDS remains a challenge faced by HIV/AIDS patients.[3] People living with HIV/AIDS tend to have more mental health problems than non-HIV-infected individuals.[4] Moreover, in addition to MSM becoming a rapidly growing subgroup of HIV, more and more people have begun to pay close attention to the survival status of MSM with HIV/AIDS. Many studies have revealed that HIV/AIDS-related stigma and discrimination are very common in Chinese MSM.[5–7] MSM are considered to be shameful and morbid from the traditional perception in China. They are reluctant to disclose their identities to the public and become a hidden population of Chinese society.[8] Due to the special identification of MSM with HIV/AIDS, the overall health status, such as health-related quality of life (HRQOL), mental health, and social support, can be difficult to understand.

Social support has been shown to be an important factor affecting the quality of life for HIV-positive patients, which can actively promote HRQOL for HIV-positive patients has been documented in the literatures.[9–11] Moreover, mental health problems commonly exist in people living with HIV, which can exert a negative impact on the HRQOL of HIV-positive individuals.[12,13] Based on these findings, we propose the hypothesis that social support can mediate mental health for exerting the impact on HRQOL. Previous studies mostly illustrated the relationship between social support and mental health status and HRQOL from a comprehensive perspective, and did not distinguish the associations between each dimension of social support, mental health, and HRQOL in detail, especially for the Chinese HIV-positive MSM population. The present study was initiated to elucidate the relationship among mental health, social support, and HRQOL as well as their dimensions and verify our hypothesis by statistical methods of canonical correlation analysis and structural equation model for this specific group. The result of the present study will help us develop effective interventions to improve HRQOL for the Chinese HIV-positive MSM.

2. Methods

A cross-sectional study was conducted between October 2014 and January 2015. Persons who were confirmed diagnosis of infection with HIV were recruited when they underwent HIV-related examination or received free anti-retroviral treatment medications in hospitals. The inclusion criteria for the recruiters were as follows: a confirmed diagnosis of HIV infection by western blot; healthy and mentally competent to complete the questionnaire; and voluntarily agreed to participate in this study. When they consented to participate then subsequently underwent a self-administered structured questionnaire or assisted face-to-face for individuals with an inability to understand the content of the questionnaire.

The conducted questionnaire was divided into 4 parts. The first part of the questionnaire included questions pertaining to basic informations, including age, ethnicity, religious faith, census register, marital status, educational level. The second part of the questionnaire involved mental health status questions using the self-rating anxiety scale (SAS) and self-rating depression scale (SDS). The third part of the questionnaire consisted of questions about social support using the social support rating scale (SSRS). The fourth part of the questionnaire involved the HRQOL assessed using the world health organization quality of life (WHOQOL)-HIV BREF scale.

The survey was administered in a separate room. Before the formal investigation, the investigators were trained to help the participants understand the purpose and meaning of the survey, and become familiar with the content of the questionnaire, and developing interviewing skills. The investigators were also trained to explain any questions raised by the participants. The survey was completely anonymously, and no identifying information was collected. The written consent informed was obtained from respondents before the anonymous interview. Participation in this survey was completely voluntary and had the right to decline to participate. During the period of investigation, a total of 500 questionnaires were retrieved from the persons who met the selection criteria, 4 infectiors refused to participate. Finally, 23 questionnaires were abandoned due to the reason of HIV-infection route was unknown, and 350 participants who claimed contracting HIV via MSM were included in the analysis.

The WHOQOL-HIV BREF scale was used as before reported, which can be classified into 6 dimensions (i.e., physical, psychological, independence, relationship, environment, and spirituality).[14–16] The Cronbach α for the overall scale was 0.866 in this study. The SSRS consists of 10 questions, and can be divided into 3 dimensions (objective support, subjective support, and support utilization). Objective support indicates that the patients received practical support, including the acquisition of material support and participating in social networks and organizations. Subjective support indicates that patients can perceive support from others or obtain emotional support, including feeling respected and understood by others. Support utilization reflects the degree of utilization of various types of social support, including the modes of pouring out to other people, seeking help, and participating in the activities of daily life. The higher the total and sub-scales scores, the greater is the likelihood of obtaining social support. The standardized Cronbach α of the SSRS scale was 0.685. The mental health was classified into 2 dimensions and evaluated by the SAS and SDS scale, respectively, both of them consist of 20 questions. The total score of both scales was multiplied by 1.25, then rounded to the nearest integer to obtain standard scores. For testers, high standard scores indicate severe symptoms of anxiety or depression. The Cronbach α of the overall SDS and SAS was 0.785 and 0.794, respectively. The SSRS, SDS, and SAS has been already used for investigation for Chinese HIV-infections.[16–18]

The current study was approved by the Ethics Committee of the Fourth Affiliated Hospital of Harbin Medical University.

EpiData version 3.1 (Epidata Association, Denmark) software was used to establish an electronic database from the questionnaires. The canonical correlation analysis was utilized to explore the relationship of each dimension of social support, mental health, and HRQOL. The structural equation model (SEM) was utilized to elaborate the direct and/or indirect effects of social support mediating mental health for exerting the impact on HRQOL. In the analysis, social support, mental health, and HRQOL were treated as latent variables, each dimension of which as described above were treated as measurable variables. In the analysis process, a confirmatory factor analysis was first utilized to explain the contribution of the measurable variables on the latent variables. The canonical correlation analysis and SEM were all performed using the SAS9.2 package (SAS Institute, Cary, NC).

3. Results

3.1. Participant demographic characteristics

Three hundred fifty HIV-infected individuals who confirmed contracting HIV via MSM. Their mean age was 33.7 ± 10.6 years. The basic demographic characteristics of the MSM were as follows: 45.1%, <30 years of age; 96.3%, Han ethnicity; 20.9%, had a religious faith; 61.7%, urban residents; marital status, 63.4% single; educational level, 43.4% college or above (Table 1).

3.2. Canonical correlation analysis between each dimension of social support, mental health, and HRQOL in HIV-infected MSM

The canonical variables produced in canonical correlation analysis involving the social support, mental health, and HRQOL dimensions were calculated. Three first pairs of canonical variables (V1W1) were verified to account for the largest

Table 1

Social-demographic characteristics of HIV-positive MSM in Harbin city.

Variables	Number (N = 350)	%
Age		
<30	158	45.1
30–40	114	32.6
>40	78	22.3
Ethnic group		
Han	337	96.3
Others	13	3.7
Religious faith		
Yes	73	20.9
No	277	79.1
Census register		
City	216	61.7
Country	134	38.3
Marital status		
Single	222	63.4
Married	77	22.0
Divorced	44	12.6
Widowed	7	2.0
Educational level		
Primary or illiteracy	15	4.3
Junior high school	70	20.0
Senior high school	113	32.3
College or above	152	43.4

HIV = human immunodeficiency virus, MSM = men who have sex with men.

Table 2

Characteristics of the first pair of canonical variables produced in cannonical correlation analysis to each dimension of social suppur, mental health, and HRQOL in HIV-infected MSM in Harbin city.

Items	V1W1[*]	V1W1[†]	V1W1[#]
Canonical correlation coefficient	0.299	0.651	0.427
Cumulative proportion	0.974	0.920	0.770
Likelihood ratio	0.908	0.542	0.767
F-value	5.67	20.40	5.27
P-value	<0.0001	<0.0001	<0.0001

HIV = human immunodeficiency virus, HRQOL = health-related quality of life, MSM = men who have sex with men.

[*] Social suppur versus mental health.
[†] Mental health versus HRQOL.
[#] Social suppur versus HRQOL.

cumulative proportion and explained the most variability of the 3 latent variables and were all statistically significant ($P < .0001$, Table 2).

Canonical correlation analysis between social support and mental health showed that the support utilization (0.789) and depression (−0.838) dimensions presented the maximum standardized canonical coefficients to the first canonical variable, indicating depression was negatively correlated with support utilization; while between mental health and HRQOL, anxiety (−0.638) and physical (0.651) dimensions displayed the maximum standardized canonical coefficients to the first canonical variable, indicating anxiety would negatively correlate with physical health. Canonical correlation analysis of the social support and HRQOL dimensions showed that subjective support (0.476), support utilization (0.475), and social relationship of HRQOL (0.710) displayed greater standardized canonical coefficients than objective support to the first canonical variable, suggesting that both subjective support and support utilization were positively associated with the social relationship of HRQOL in HIV-positive MSM (Table 3).

3.3. Structural equation model analysis the relationship among social support, mental health, and HRQOL and their dimensions in HIV-infected MSM

The assessed model fitting was as follows: the root mean square residual (RMSR) was 0.068, the adjusted for degrees of freedom

Table 3

The standardized canonical coefficients of the first pair of canonical variables with the each measured variables.

Items	V1[*]	W1[*]	V1[†]	W1[†]	V1[#]	W1[#]
Subjective support	0.255					0.476
Objective support	0.231					0.435
Support utilization	0.789					0.475
Anxiety		−0.235	−0.638			
Depression		−0.838	−0.471			
Physical				0.651		0.210
Psychological				−0.011		−0.080
Independence				0.164		−0.133
Relationship				−0.001		0.710
Environment				0.213		0.399
Spirituality				0.172		−0.031

[*] Social suppur versus mental health.
[†] Mental health versus HRQOL.
[#] Social suppur versus HRQOL.

(AGFI) was 0.8198, the parsimonious goodness of fit index (GFI) was 0.6620, the root mean square error of approximation (RMSEA) estimate was 0.1052. The chi-square value was 199.3023, the chi-square DF was 41, and the $P < .0001$. The significant chi-square result suggested that there was a difference between the hypothesized model and the data; however, the RMSR, AGFI, GFI, and RMSEA indices supported the model as a good fit with the data.

Results from confirmatory factor analysis showed that in each dimension of social support, the support utilization's factor loading was the largest (0.632), indicating that support utilization contributed most to social support. While in the dimension of mental health, depression had larger factor loading (0.816) and exerted greater contribution on mental health status than anxiety. While in HRQOL, the environmental dimension exhibited the largest factor loading (0.833) and contribution correspondingly (Fig. 1).

The structural coefficients between social support and mental health was -0.433 ($T = -5.88$), mental health and HRQOL was -0.592 ($T = -10.33$), while social support and HRQOL was 0.290 ($T = 4.10$), suggesting social support not only exerted a direct influence, but also mediated the mental health to have an indirect effect on HRQOL for HIV-positive MSM (Fig. 1).

4. Discussion

With the rapid growth of the HIV epidemic amongst MSM, the status of HRQOL, social support, and mental health status has become a concerning issue; however, because MSM are discriminated by traditional Chinese perceptions, most MSM conceal their identities, and thus this population is especially difficult to contact. Our study elaborated the relationship among social support, mental health, HRQOL and their dimensions utilizing the statistical methods of canonical correlation analysis

and structural equation model. The present study results provide the benefit of understanding the obstacles towards to care for this group.

Through the canonical correlation analysis in our study, anxiety was verified to be strongly correlated with poor physical health in HIV-positive MSM. While social support, especially support utilization, was negatively associated with depressive symptoms. The results from some studies had indicated a high level of depressive symptoms were related to a poor level of medication compliance and could reduce the quality of life and treatment outcome,[13,19,20] while social support was confirmed to alleviate the level of depression.[10,21] Support utilization reflects the degree of utilizing various types of available support, such as modes of pouring out to other people, seeking help, and participating in social activities in their daily lives. Even though most MSM were able to get favorable support from others, if not sufficiently utilized, support will be ineffectual. Subjective support and support utilization showed stronger correlation with social relationship of HRQOL in our analysis. Owing to the features of MSM population, and their HIV-infection double identities will make them suffer from more stigma and discrimination from Chinese communities and produce the barrier of social communication with others, which will result in many of them are forced to conceal their homosexual identities and HIV infection status. It will inevitably prevent them from arousing subjective support enoughly and utilizing the available supports actively. Thus, it will be an effective measure of increasing subjective support and enhance the ability of utilizing available supports to improve the social relationship of HRQOL for this specific group.

The results of SEM analysis showed environmental dimension possessed maximum factor loading and had accounted for the most variation of the HRQOL for HIV-positive MSM. Environmental dimension mainly incorporates the components
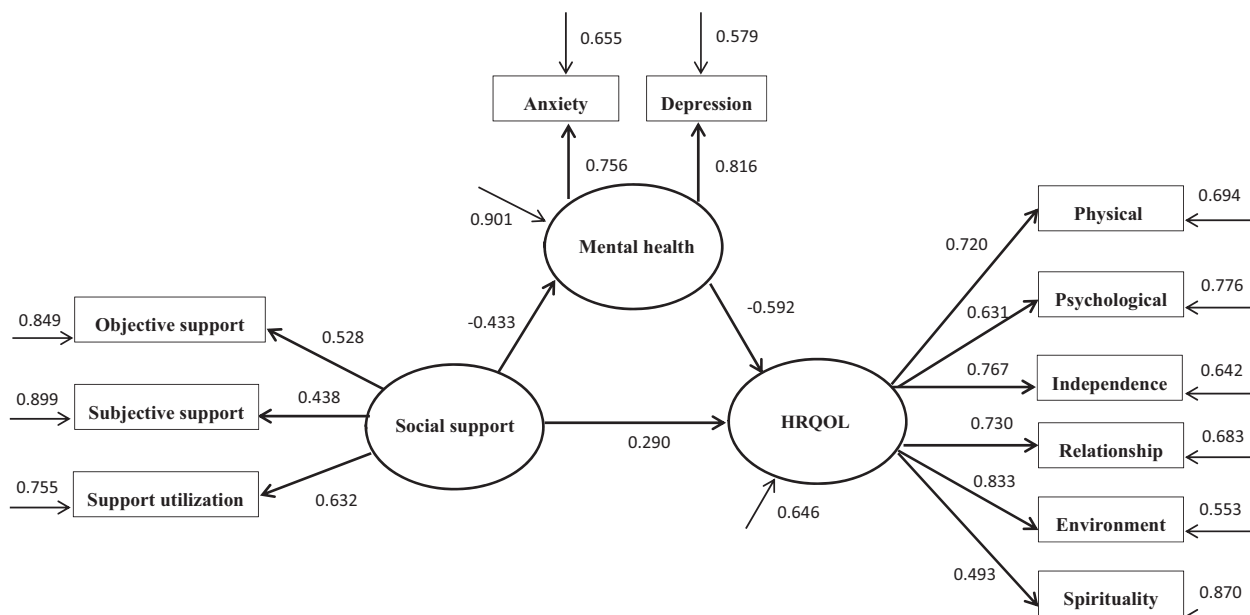
Figure 1. The result of SEM demonstrated the interrelation among dimensions of social support, mental health, and HRQOL in HIV-positive MSM in Harbin. The values of numbers adjoin the arrows pointing outward and sending out from the above 3 latent variables were the standardized factor loading. The numerical value adjoin the unidirectional arrows sending out from each latent variable were the standardized structural coefficient. The numerical value adjoin the inward arrows point to each dimension of latent variables were the estimated standard error. HIV = human immunodeficiency virus, HRQOL = health-related quality of life, MSM = men who have sex with men, SEM = structural equation model.

of personal safety, living environment, social or health concern, sources of income, opportunity to acquire new information and skills, and participating in recreational activities. Considering that MSM were most urban residents and had better educational backgrounds in present study, the most serious impact on environmental health should come from the barriers of participating in various social activities or losing the chance to get new information or skills, which may be the consequence of fearing stigma and discrimination from the public due to their MSM and HIV infection identities. To create a tolerant and friendly social environment is foremost in improving the HRQOL. In addition, SEM analysis also reveals support utilization and depression possessed maximum factor loading and showed the strongest contribution on social support and mental health, suggesting taking effective interventions to decrease the depressive symptoms and strengthen the ability of utilizing support maybe contribute mostly for improving the mental health and social support state for HIV-positive MSM. In addition, based on the results of SEM analysis we deduced that mental illness can exert a strong negative impact on HRQOL of MSM (−0.592). Social support had a better effect against mental illness (−0.433), but the direct effect of social support promoting the quality of life was not apparent (0.290). The direct effect of enhancing social support was improvement in mental health, thereby improving HRQOL indirectly for HIV-positive MSM.

Overall, our study revealed depression and anxiety had a negative correlation with support utilization and physical health, while subjective support and support utilization were positively correlation with the social relationship of HRQOL among HIV-positive MSM. Support utilization, depression, and environmental health explained the greatest variation of social support, mental health, and HRQOL in this population. Social support not only exerts a direct influence on HRQOL, but also mediates mental health and exerts an indirect effect on HRQOL. The most direct effect of increasing the degree of social support, especially for support utilization, is to reduce the mental illness of depression and thus most improve the HRQOL of environmental dimension for them. Moreover, we also can increase the physical health by alleviating their anxiety symptoms. Conclusively, present study highlights the standpoints that enhance the ability of utilizing supports to buffer the mental illness of depression and create a friendly and tolerant social environment to weaken the impact of stigma and discrimination from the public, which is a necessary and suitable method to increase the HRQOL for HIV-positive MSM. Mental health services should be provided immediately and accompanied by HIV outpatient or hospitalization in medical institutions to prevent mental illness for this special group.

Several limitations in the present study should be noted. As with all cross-sectional surveys, all measures were subjected to recall bias as self-reports of preferences in recent living conditions. Second, the current study was based on clinical-based population so that would be careful when generalize these conclusions to other non-clinical population. Third, the study was carried out in a specific geographic location, and thus it may not be possible to extrapolate the conclusions herein to MSM living in other regions.

Acknowledgments

The authors thank all of the participants for their cooperation to complete the questionnaires in this survey.

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