

Impact of social support on medication adherence and the mediating role of depression in patients with HIV/AIDS in Chongqing

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Abstract: This study aimed to analyze the current status of medication adherence of HIV/AIDS patients receiving antiretroviral therapy(ART) in Chongqing and to explore the mediating effect of depression in the impact of social support on medication adherence. A total of 568 HIV/AIDS patients with failed ART were included as study subjects, and data on patients' demographic characteristics, depression, social support factors, and medication adherence were collected through questionnaire surveys, and mediation analyses were used to analyze the mediating effect of depression on the relationship between social support factors and medication adherence. The results indicated that 67.08% felt a high level of social support, 36.8% were in depression and 54.4% had good medication adherence. The mean score of medication adherence was moderate at 6.8 ± 1.5 . Depression in HIV/AIDS patients mediates the effect of social support on medication adherence. The mediating effect (0.031, 95% CI: 0.018–0.051) accounted for 46.3% of the total effect (0.067, 95% CI: 0.029–0.101). In conclusion, the percentage of HIV/AIDS patients with good adherence to medication in Chongqing is relatively low. By increasing the level of social support and helping patients to alleviate anxiety, medication adherence can be effectively improved and treatment outcomes can be improved.

1. Introduction

Antiretroviral therapy (ART) serves as the cornerstone of clinical management for HIV/AIDS, effectively suppressing viral replication and delaying disease progression^[1]. To ensure therapeutic efficacy and facilitate immune reconstitution, long-term adherence to medication is paramount for patients^[2]. Although ART has significantly reduced mortality rates and prolonged survival among people living with HIV/AIDS(PLWHA)^[3], treatment failure remains a prevalent challenge. Suboptimal adherence is a primary contributor to both treatment failure and the emergence of drug resistance^[4]; thus, medication adherence in this population warrants critical attention.

Existing literature suggests that, compared to socioeconomic determinants such as financial status and educational attainment, psychosocial factors are generally more amenable to targeted interventions^[5]. To enhance the quality of life for PLWHA, it is essential to gain a comprehensive

understanding of their psychosocial needs. Addressing and improving psychosocial well-being—such as alleviating depressive symptoms and bolstering social support—may yield greater health benefits than clinical treatment alone^[6]. Previous studies have indicated that depression can compromise medication adherence in PLWHA, and that robust social support is typically associated with reduced negative affect^[2]. However, the specific mechanisms through which depression moderates or mediates the relationship between social support and medication adherence remain underexplored.

Focusing on PLWHA in Chongqing, China, this study aims to assess the current status of ART adherence and to investigate the mediating role of depression in the association between social support and medication adherence. The findings are intended to provide an empirical foundation for developing targeted psychosocial interventions to improve treatment adherence in this population.

2. Subjects and methods

2.1. Study subjects

This study was conducted from March to June 2025, with the survey covering all 39 districts and counties in Chongqing Municipality. A convenience sampling method was employed to recruit participants from the Comprehensive AIDS Prevention and Control Information System of the China CDC. A total of 600 questionnaires were distributed, of which 568 were deemed valid, yielding an effective response rate of 94.7%. All enrolled participants met the predetermined inclusion and exclusion criteria. Inclusion criteria: (1) aged 18 years or older; (2) provided informed consent and voluntarily agreed to participate in the study; and (3) currently receiving antiretroviral therapy (ART) locally. Exclusion criteria: (1) presence of mental or intellectual disabilities; and (2) presence of language or communication barriers. This study was approved by the Ethics Committee of the Chongqing Municipal Center for Disease Control and Prevention (Approval No.: KY-2024-005-1).

2.2. Methods and content

Coordinated by the district or county Centers for Disease Control and Prevention (CDCs), and with the collaboration of primary healthcare facilities and follow-up physicians, the purpose and significance of this survey were explained to the patients upon obtaining their informed consent. A one-on-one interview was conducted by trained follow-up physicians using a customized questionnaire.

The questionnaire in this study comprised four sections for PLWHA: (1) basic demographic characteristics, including age, ethnicity, gender, residency, educational level, marital status, occupation, and income; (2) medication adherence; (3) perceived social support; and (4) assessment of depression.

Social support was assessed using the Social Support Rating Scale (SSRS) developed by Xiao Shuiyuan^[7]. The scale comprises 10 items across three dimensions: subjective support (4 items), objective support (3 items), and utilization of support (3 items). Total scores range from 12 to 66, with higher scores indicating greater perceived social support. Scores below 35 denote low support, 35–45 indicate moderate support, and scores above 45 reflect high support. In the present study, the internal consistency reliability (Cronbach's α) of the SSRS was 0.82.

Medication adherence was evaluated using the 8-item Morisky Medication Adherence Scale (MMAS-8). This questionnaire consists of 8 items with a total score ranging from 0 to 8^[8]. Adherence was categorized into three levels based on the total score: poor (<6), moderate (6–7), and good (8). The internal consistency reliability (Cronbach's α) for the MMAS-8 in this study was

0.76.

Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9). The scale consists of 9 items, each scored from 0 to 3, with higher total scores indicating more severe depressive symptoms in the recent period. Total scores of 0–4, 5–9, 10–14, and ≥ 15 correspond to no depression, mild depression, moderate depression, and severe depression, respectively^[8]. The internal consistency reliability (Cronbach's α) of the PHQ-9 in the current study was 0.80.

2.3. Statistical processing

The research data were independently double-entered and verified using EpiData 3.1 software, and statistical analyses were subsequently performed using SPSS 27.0. Descriptive results are presented as frequencies and percentages, and between-group comparisons of categorical variables were conducted using the chi-square (χ^2) test. After controlling for variables that demonstrated statistical significance in the univariate analysis, partial correlation analysis was employed to explore the interrelationships among social support, depressive status, and medication adherence. The partial correlation coefficient (r) was used to indicate the strength and direction of the linear relationship between any two variables. Furthermore, the mediating effect of depressive status on the relationship between social support and medication adherence was examined using Model 4 of the PROCESS macro. The mediation effect was tested via the Bootstrap method with a 95% confidence interval (95%CI). The significance level was set at $p < 0.05$.

3. Results

3.1. Demographic characteristics

Among the 568 participants surveyed, 431 were male (75.9%), with a mean age of 36.07 ± 12.69 years. The largest age group was 21–40 years (42.1%). The most common educational level was junior middle school (32.74%). Married or cohabiting individuals accounted for 43.3% of the sample, and 56.7% reported a monthly income below 3,000 RMB. Furthermore, 30.28% of the participants were receiving free medication, and 26.9% reported a history of alcohol consumption (Table 1).

Table 1 Univariate analysis of demographic feature and medication adherence in patients with HIV/AIDS [n=568,n(%)].

Variable	Medication adherence			n	χ^2	P-value
	Poor (n=42)	Moderate (n=217)	Good (n=309)			
Gender					4.903	0.179
Male	37 (8.58)	166 (38.52)	228 (52.90)	431		
Female	5 (3.65)	51 (37.23)	81 (59.12)	137		
Age					29.607	0.001
18~20	1 (14.29)	3 (42.86)	3 (42.86)	7		
21~40	17 (7.11)	116 (48.54)	106 (44.35)	239		
41~60	12 (5.83)	64 (31.07)	130 (63.11)	206		
>60	12 (10.34)	34 (29.31)	70 (60.34)	116		
Residency					1.940	0.585
Rural	17 (8.67)	70 (35.71)	109 (55.61)	196		
Urban	25 (6.72)	147 (39.52)	200 (53.76)	372		
Ethnicity					0.459	0.928
Han ethnic group	46 (8.91)	184 (35.66)	286 (55.43)	516		
Minority ethnic group	4 (7.69)	20 (38.46)	28 (53.85)	52		
Occupation					17.367	0.136
Temporary work	10 (5.95)	67 (39.88)	91 (54.17)	168		

Long-term work	14 (7.04)	83 (41.71)	102 (51.26)	199		
Farming	10 (9.90)	40 (39.60)	51 (50.50)	101		
Student	1 (7.14)	6 (42.86)	7 (50.00)	14		
Retired/not employed	7 (8.14)	21 (24.42)	58 (67.44)	86		
Monthly income (CNY)					23.790	0.162
<3000	26 (8.07)	111 (34.47)	185 (57.45)	322		
3000~8000	14 (6.86)	88 (43.14)	102 (50.00)	204		
>8000	2 (4.76)	18 (42.86)	22 (52.38)	42		
Educational level					11.014	0.528
Primary school degree or below	8 (6.20)	47 (36.43)	74 (57.36)	129		
Junior high school	16 (8.60)	62 (33.33)	108 (58.06)	186		
High school or vocational secondary school	9 (7.03)	53 (41.41)	66 (51.56)	128		
Associate degree or bachelor's degree	9 (7.56)	53 (44.54)	57 (47.90)	119		
Master's degree or higher	0 (0.00)	2 (33.33)	4 (66.67)	6		
Marital status					20.526	0.002
Unmarried	15 (7.46)	98 (48.76)	88 (43.78)	201		
Married or cohabiting	19 (7.72)	72 (29.27)	155 (63.01)	246		
Separated/divorced/widowed	8 (6.61)	47 (38.84)	66 (54.55)	121		
ART payment method					25.658	0.002
Free	29 (6.36)	185 (40.57)	242 (53.07)	456		
Medical insurance /out-of-pocket	13 (11.60)	34 (30.36)	65 (58.04)	112		
Drinking					12.551	0.013
Yes	27 (17.65)	60 (39.22)	66 (43.14)	153		
No	51 (13.53)	98 (25.99)	228 (60.48)	377		
Abstinent from alcohol	3 (7.89)	14 (39.47)	21 (55.26)	38		
Medical Insurance					12.331	0.654
Yes	41 (7.47)	208 (37.89)	300 (54.64)	549		
No	1 (5.26)	9 (47.37)	9 (47.37)	19		

3.2. Distribution of social support, depressive status, and medication adherence among PLWHA

In this survey, the mean score on the Social Support Rating Scale was 42.81 ± 8.63 , the score on the Depression Screening Scale was 4.42 ± 4.93 , and the score on the Morisky Medication Adherence Scale was 6.8 ± 1.5 . Among the respondents, 54.4% demonstrated good medication adherence, whereas only 67.08% reported receiving a high level of social support. Furthermore, 36.8% of the participants exhibited symptoms ranging from mild to severe depression (Table 2).

Table 2 Distribution of the various types of scales.

Scale	Group	n (%)
The Social Support Rating Scale	High support	381 (67.08)
	Moderate support	119 (20.95)
	Low support	68 (11.97)
The Patient Health Questionnaire-9	No depression	359 (63.20)
	Mild depression	129 (22.71)
	Moderate depression	50 (8.8)
	Severe depression	30 (5.28)
Te Morisky Medication Adherence Scale	Good	309 (54.4)
	Moderate	217 (38.2)
	Poor	42 (7.39)

3.3. Partial correlation analysis of social support, depression state, and medication adherence

As shown in Table 3, after controlling for age, marital status, payment method for ART, and Drinking, partial correlation analysis revealed a significant positive correlation between patients' level of social support and medication adherence ($r = 0.148$). Conversely, depression was significantly negatively correlated with both social support and medication adherence ($r = -0.328$ and -0.246 , respectively).

Table 3 Partial correlation analysis of social support, depression state, and medication adherence.

Variable	r	P -value
Social support & medication adherence	0.148	<0.001
Depression & social support	-0.328	<0.001
Depression & medication adherence	-0.246	<0.001

3.4. Mediating effect of depression in the association between social support and medication adherence in PLWHA

After controlling for covariates with statistical significance, such as age and marital status, a mediation analysis was conducted to examine the role of depression in the relationship between social support and medication adherence. The results indicated that the total effect of social support on medication adherence was significant (95% CI : 0.029–0.101). Furthermore, the mediating effect of depressive status was also significant (95% CI : 0.018–0.051), accounting for 46.3% of the total effect (see Table 4 and Figure 1).

Table 4 Mediating effect of depression in the association between social support and medication adherence.

	Effect value (95% CI)	SE	Relative mediation effect (%)
Indirect effect	0.031 (0.018~0.051)	0.008	46.3
Direct effect	0.036 (-0.003~0.069)	0.018	53.7
Total effect	0.067 (0.029~0.101)	0.017	-

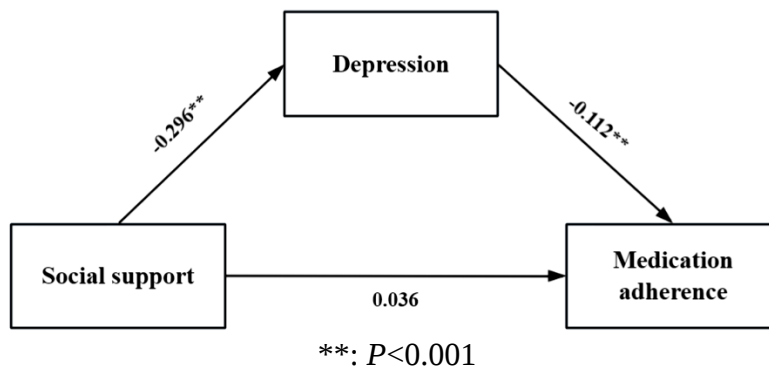


Figure 1 Mediating effect of depression in the association between social support and medication adherence.

4. Discussion

In this study, patients who were married or cohabiting demonstrated higher medication adherence than those living alone. This may be attributed to a heightened sense of family responsibility, which strengthens their willingness to continue treatment^[9], as well as the presence

of family members who provide companionship and medication supervision, thereby facilitating regular dosing^[10-11]. Furthermore, patients aged 40 years and older exhibited better adherence compared to those under 40. This disparity may stem from a more comprehensive understanding of the nature of AIDS and the importance of ART among older patients^[12]. Conversely, younger patients may lack sufficient motivation to adhere to treatment due to higher rates of migrant work, more unstructured lifestyles, and concerns regarding potential stigma or disclosure^[13]. Consistent with previous research^[14], patients utilizing medical insurance or paying out-of-pocket for medications showed higher adherence than those receiving free medications. This is likely because patients bearing partial or full medication costs tend to be more attentive to their health status. Additionally, the survey revealed that non-drinkers had higher adherence rates than drinkers. Alcohol consumption elevates the risk of chronic diseases and other comorbidities. The interaction between alcohol and antiretroviral drugs increases the metabolic burden on the pancreas and liver, making adverse drug reactions more likely, which in turn diminishes patients' willingness to continue treatment^[15-16]. Prolonged alcohol use may also impair cognitive function and memory, further hindering patients' ability to maintain a regular medication schedule^[17].

Among the study population, 54.4% demonstrated good medication adherence, a rate lower than that reported by Chen Zongliang^[18] among HIV/AIDS patients in the main urban districts of Chongqing. This discrepancy may be explained by the higher educational attainment and income levels of patients in Chongqing's urban core, which likely foster a better understanding of the importance of ART. Moreover, since Chen's study sampled patients attending medication pick-up clinics, those participants inherently possessed a stronger willingness to adhere to treatment. Meanwhile, 36.8% of the surveyed participants exhibited depressive symptoms, a prevalence comparable to the findings of Wu Yushan^[19] regarding depression among HIV/AIDS patients in Chongqing.

Research findings indicate that the level of social support received by individuals living with HIV/AIDS significantly influences their adherence to antiretroviral therapy. The synergistic effects of social welfare policies, professional medical supervision, and emotional support from family and friends effectively enhance patients' medication adherence. This study observed that social and familial support improves adherence by fostering a sense of belonging and security among patients, a mechanism consistent with the findings of Mitchell^[20]. Given that social support is a critical determinant of medication adherence, these results underscore the necessity of developing multidimensional support strategies. Such strategies should encompass practical assistance, medical oversight, and emotional care to reinforce patients' confidence in their treatment and strengthen their motivation for consistent medication adherence.

This study further demonstrates that depression serves as a mediator between medication adherence and social support among PLWHA. Consistent with the findings of Zeng^[21], high levels of social support can alleviate patients' fear of social interaction and enhance their capacity to cope with external stigma, thereby ameliorating depressive symptoms. During antiretroviral therapy, PLWHA frequently experience psychological distress, including panic, inferiority, and depression. If left unaddressed, these conditions can diminish their willingness to adhere to treatment. Furthermore, sustained psychological stress may lead to a decline in immune cell markers, compromising overall therapeutic outcomes. When patients fail to achieve expected clinical efficacy, their confidence in treatment may be further undermined, precipitating a vicious cycle of declining adherence^[22]. Empirical evidence confirms that maintaining robust, trust-based relationships with family and friends helps mitigate emotional distress, such as depression and feelings of inferiority, thereby encouraging more active engagement with medical regimens. Patients accompanied by family members during follow-up visits exhibit greater trust in their treatment plans and demonstrate superior adherence to medical advice^[23]. Adequate social support may effectively

buffer the disruptive impact of negative psychological states on medication-taking behavior. Mediation model analysis revealed that the indirect effect of depression accounted for 46.3% of the total effect, whereas the direct effect of social support was not statistically significant. This finding aligns with a telephone survey-based study conducted in South Africa^[24], suggesting the potential existence of other mediating variables, such as self-efficacy, stigma, and disease-related cognition^[25].

Consistent with the findings of Wen et al.^[26], this study also found that depressive symptoms in PLWHA are associated with reduced medication adherence. Therefore, when suboptimal adherence is identified, clinicians should incorporate assessments of psychological status and social support levels into routine follow-ups, alongside evaluations of treatment regimens and adverse drug reactions, to guide the implementation of individualized interventions.

A limitation of this study is the reliance on self-report questionnaires to assess social support and depression, which precludes the complete elimination of recall bias. Future research should employ multi-method and multi-indicator measurement approaches. Additionally, as this study is based on cross-sectional data, it can only capture associations between outcomes and exposures at a single time point. Future investigations should utilize longitudinal designs and analytical methods to track these relationships over time.

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