Research Topics

Evidence on the benefits of integrating mental health and HIV into packages of essential services and care

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Evidence on the benefits of integrating mental health and HIV into packages of essential services and care

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Editorial: Evidence on the benefits of integrating mental health and HIV into packages of essential services and care

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Editorial on the Research Topic
Evidence on the benefits of integrating mental health and hiv into packages of essential services and care

Introduction

People living with HIV (PLWH) suffer disproportionately higher levels of mental disorders than the general population, both in high-income and low- and middle-income countries (1). There is also evidence to suggest that the burden of mental disorders is worse `in HIV compared to other chronic diseases (2). Mental disorders negatively affect client engagement and care retention and result in significant distortions in health outcomes at every stage of the HIV care continuum (1). The need for mental health care for PLWH is critical to mitigate HIV transmission and progression and improve clinical outcomes by creating awareness for mental disorders and integrating mental health services into the HIV care continuum. The Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO) have underscored the importance of integrating HIV and mental health services, considering that both conditions accentuate each other's risk. Also, Integrated HIV-mental health approaches lead to better health outcomes, overall well-being and quality of life (3). More so, the "feasibility and acceptability of integrating mental health screening into an existing community-based program for prevention of mother-to-child transmission of HIV targeted at pregnant women and their male partners" is acceptable (4). For success, service integration should conform with all the critical elements of integrated service delivery as outlined by the WHO- "*the management and delivery of health care services so that the clients receive a continuum of preventive and curative services that cater to their needs over time and across different levels of the health system*" (5).

This editorial highlights some of the benefits of HIV-mental health services integration by introducing nine manuscripts published as a collection in response to the Research Topic: *Evidence on the Benefits of Integrating Mental Health and HIV into Packages of*

TABLE 1 Summary of studies in this collection.

s/n	Study theme	Title	Authors	Setting Study	Study Design	Objective(s)	Sample size	Study population
1	HIV infection is disproportionately associated with mental disorders	Depression and Perceived stress among perinatal women living with HIV in Nigeria	Akinsolu et al	Southwest, Nigeria	Cross-sectional	To determine the prevalence and factors associated with depression and psychological stress	402	Pregnant or recently delivered women (within two years) living with HIV aged 19 to 49 years
2		Association between depression and HIV infection vulnerable populations in United States adults: a cross-sectional analysis of NHANES from 1999 to 2018	Xu et al	United States of America	Cross-sectional	To review and evaluate the association between depression and HIV infection	16,584	HIV adult vulnerable populations
3		Loneliness as a mediation from social support leading to a decrease of health-related quality of life among PLWHIV	Qian et al	China	Cross-sectional	To investigate the potential mediation mechanism of loneliness between social support and HRQoL	201	Adults accessing HIV care in a hospital
4		HIV-related stress predicts depression over five years among people living with HIV.	Liu et al	China	Longitudinal observational	To explore the longitudinal relationship between HIV-related stress, social support, and depression among people living with HIV	320	Adults living with HIV
5		Prevalence of suicide ideation among HIV/AIDS patients in China: A systematic review and meta-analysis	Li et al.	China	Systematic Review	To comprehensively analyze the prevalence of suicidal ideation among HIV/AIDS patients	6,174	Cross-sectional studies of adults with a sample size greater than 25
6		Implementation of trauma-informed care and trauma-responsive services in clinical settings: a latent class regression analysis	Anderson et al	Southeastern United States of America	Cross-sectional	To identify subgroups of HIV clinics based on their unique profiles of inner setting characteristics and assess how subgroup membership is related to the degree of TIC implementation and number of trauma-responsive services offered	317 (and 47 clinics)	Employees of HIV clinics
7	Mental disorders adversely affect HIV-related health outcomes	Loneliness as a mediation from social support leading to a decrease of health-related quality of life among PLWHIV	Qian et al.	China	Cross-sectional	To investigate the potential mediation mechanism of loneliness between social support and HRQoL	201	Adults accessing HIV care in a hospital
		Prevalence of suicide ideation among HIV/AIDS patients in China: A systematic review and meta-analysis	Li et al.	China	Systematic Review	To comprehensively analyze the prevalence of suicidal ideation among HIV/AIDS patients	6,174	Cross-sectional studies of adults with a sample size greater than 25
		Factors influencing self-efficacy for self-management among adult people with human immune deficiency virus on antiretroviral therapy in public hospitals of south-west Ethiopia	Aldisa et al	Southwest, Ethiopia	Cross-sectional	To identify factors influencing self-efficacy for HIV self-management	413	Adults accessing antiretroviral therapy in public hospitals
8	HIV-mental health service integration is beneficial	Exploring experiences of HIV care to optimize patient-centred care in Conakry, Guinea: a qualitative study	Kolie et al	Conakry, Guinea	Qualitative exploratory	To describe the patient-provider relationship and explore the challenges to optimal and patient-centred care	17 in-depth interviews and six focused group discussions	Adults accessing HIV care and caregivers in urban health facilities
9		Higher rates of mental health screening of	Concepcion et al	Thika, Kenya	Qualitative exploratory and	To design and pilot an evidence-based provider	1,154	Adolescent girls and young women

(*Continued*)

TABLE 1 Continued

s/n	Study theme	Title	Authors	Setting Study	Study Design	Objective(s)	Sample size	Study population
		adolescents recorded after provider training using simulated patients in a Kenyan HIV clinic: results of a pilot study			interrupted time series	training strategy, simulated patient encounters		seeking health services at public HIV clinics
		Implementation of trauma-informed care and trauma-responsive services in clinical settings: a latent class regression analysis	Anderson et al	Southeastern United States of America	Cross-sectional	To identify subgroups of HIV clinics based on their unique profiles of inner setting characteristics and assess how subgroup membership is related to the degree of TIC implementation and number of trauma-responsive services offered	317 (and 47 clinics)	Employees of HIV clinics

Essential Services and Care. The manuscripts are from both high-income and low- and middle-income countries. Specifically, three are from China, two from the United States of America and one each from Ethiopia, Guinea, Kenya and Nigeria. The manuscripts (1) underscore the high prevalence of mental disorders among people living with HIV, (2) demonstrate that mental disorders lead to suboptimal health outcomes among PLWH, and (3) demonstrate the value of integrating mental health care into HIV care programs (Table 1).

HIV infection is disproportionately associated with mental disorders

PLWH experience disproportionately high levels of many common mental disorders. Depression is significantly associated with HIV infection in studies from Nigeria, the US and China (Akinsolu et al., Xu et al., Qian et al., Liu et al.). The accentuated burden of depression in HIV, which likely exceeds that of other chronic diseases, is thought to be mediated by HIV-related stress (2). Depression is also commoner among HIV-vulnerable populations (Xu et al.), suggesting that the drives of HIV infection may also drive depression. This collection emphasizes the mediatory role of stress and loneliness in HIV-related depression. Stress is prevalent among PLWH (Akinsolu et al.), and stress and loneliness are potent predictors of depression and anxiety among PLWH, especially in the early stages of HIV infection (Liu et al., Qian et al.). Also, suicidal ideation is prevalent and rising among PLWH (6, 7). A meta-analysis of sixteen Chinese studies shows that about one-third of PLWH had suicidal ideation (Li et al.). Furthermore, interpersonal violence is also common among PLWH (Anderson et al.).

Although it has been demonstrated that mental disorders are commoner among PLWH than the general population, it is unlikely that all HIV subpopulations are equally vulnerable to mental disorders. This collection shows that men, homosexuals, unmarried and the depressed are more affected by suicidal ideations. Also, longer periods since HIV diagnosis and lower CD4 cell counts were associated with a higher risk of suicidal ideation (Li et al.). Other factors that are related to mental disorders in PLWH include being female, serodiscordant partners, low-income levels, lack of family support, duration on ART and the gestational age among HIV-positive pregnant women (Akinsolu et al.).

Mental disorders adversely affect HIV-related health outcomes

Mental disorders are associated with HIV progression, poor medication adherence and exacerbation of the social and economic barriers to accessing HIV care, resulting in poor health outcomes and suboptimal quality of life (8). In this collection, Qian et al. used a Structural Equation Model to demonstrate a link between loneliness and reduction in health-related quality of life. Suicidal ideation is also associated with lower CD4 counts (Li et al.), while low self-efficacy is also related to drug side effects (Abdisa et al.). More so, the social context and stigmatising social process in which PLWH live, causes them to be stigmatised which further affects HIV-related health outcomes (9).

HIV-mental health service integration is beneficial

Integrating mental health services into HIV care programs has the potential to mitigate the risk of disease progression and engender better health outcomes. Integrated service delivery also increases health system efficiency and patient satisfaction. Although available evidence demonstrates the value of service integration, health system challenges, including human resources, infrastructure and supply chain management, often constitute significant hindrances. Critical success factors include human capital development, awareness creation, stakeholder ownership and commitment and continuous health system development (5).

This collection also demonstrates the benefit (real or potential) of implementing mental health care interventions within HIV care programs. Integration of psychosocial counselling into HIV care promotes confidentiality, provider availability and care, improved access to antiretrovirals and patient preferences. These factors in turn optimize patient-centred care and result in better health outcomes for people living with HIV (Kolie et al.). Also, building the capacity of HIV caregivers will increase the enhance the diagnosis and referral of mental disorders. Concepcion et al. piloted a three-day Simulated Patient Encounter training on HIV care providers in Kenya. The study shows that evidence-based provider training can improve their competencies and service delivery for common mental disorders in HIV care settings. Anderson et al. underlined the significance of implementing trauma-informed care and trauma-responsive services in HIV settings to avoid re-traumatization in those with experience of intimate partner violence. The study also demonstrates that the success of HIV-mental health integration strategies hinges on the appropriate characterization of health facilities based on critical success factors depending on the core issue under consideration.

In summary, mental disorders disproportionately affect PLWH and result in poor HIV and mental health outcomes. Integrating mental health and HIV into Packages of Essential Services and Care will help recognize and address mental health needs and result in better health outcomes among PLWH.

Author contributions

OA: Writing – original draft, Writing – review & editing. TI: Writing – original draft, Writing – review & editing. SL: Writing – original draft, Writing – review & editing.

Conflict of interest

The authors declare that this research conduct was without any commercial or financial relationships that could constitute a potential conflict of interest.

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Loneliness as a mediation from social support leading to a decrease of health-related quality of life among PLWHIV

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This study focused on the mental health of people living with HIV(PLWHIV) and explored their relationship between loneliness and perceived social support, health related quality of life (HRQoL) with a method of structural equation model. We collected clinical and psychological data from consecutively enrolled PLWHIV. A total of 201 PLWHIVs were enrolled and measured with self-reporting survey instruments of UCLA Loneliness Scale, Self-Rating Depression Scale, Self-Rating Anxiety Scale, Social Support Ratio Scale and Short Form Health Survey-36. The levels of loneliness, depression, anxiety, perceived social support and HRQoL were assessed. PLWHIV enrolled were divided into two groups of loneliness and non-loneliness based on their UCLA Loneliness Scale scores. Multivariable analysis indicated that being married is a protective factor associated with loneliness (OR = 0.226; $P = 0.032$). We further found the loneliness group had a higher level of depression ($P < 0.001$) and anxiety ($P < 0.001$), but lower level of HRQoL ($P < 0.001$) than the non-loneliness group. We found there was a positive linear correlation between social support and HRQoL among the enrolled PLWHIVs ($r^2 = 0.0592$; $P = 0.0005$). A structural equation model (SEM) was established to evaluate whether the loneliness played as a mediation role between social support and HRQoL. The model showed loneliness as a mediation from social support leading to a decrease of HRQoL. Our findings showed a potential psychological pathway from social support to HRQoL, suggesting the need for interventions focusing on social support may improve poor HRQoL lead by loneliness.

KEYWORDS

people living with HIV, loneliness, mediation, mental health, health related quality of life, social support

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Introduction

With the widespread use of effective antiretroviral therapy (ART), great progress has been made in increasing the life expectancy of people living with HIV (PLWHIV) (1). HIV infection has been gradually developing into a chronic disease while the mental health of PLWHIV has become a focused issue, which was reported as a key factor affecting HIV treatment outcomes in high-income countries (2). However, the mental health of PLWHIV has only recently received the attention it deserves in low- and middle-income countries (3). PLWHIV are at increased risk of developing mental health conditions that range from acute stress reactions to neurocognitive disorders and negative emotional experiences (4). These negative conditions could undermine health-seeking behaviors and reduce adherence to treatment (5) which contributed to worse health-related quality of life (HRQoL) and lead to higher rates of mortality (6–8). The HRQoL of PLWHIV was usually evaluated with tools of MOS (Medical Outcome Study)-HIV and Functional Assessment of HIV Infection (FAHI) (9). HRQoL refers to patient reports of functioning and well-being in physical, mental, and social domains of life. But the terms quality of life and HRQoL have often been used interchangeably (10). The behaviors can be characterized by medical coping modes which have been proven as essential indicators for the improvement of QoL (11). While social support has been proved effectively protecting both physical and mental health (12). This relative relationship does not change according to gender (13). A previous study also indicated that the odds of participating in HIV risk behaviors decreased with social support (14).

However, the specific mechanism of how perceived social support leading to disorientating HRQoL still remains unknown. Recent studies (15, 16) indicated that loneliness may be an affecting factor for poor HRQoL. Similar findings were confirmed in pregnant mothers from Canada (17). Furthermore, loneliness can be a risk factor but also a mediator in complex psychosocial interaction networks (18). Loneliness is regarded as an important section of mental health defined as a subjective emotional experience different from the definition of social isolation referring to the actual number of social contacts a person has (19). A definition of loneliness is that it is a vital negative emotion defined as an unpleasant, subjective experience resulting from the lack or quality of social relationships (20). Loneliness is also established with increased psychiatric symptoms such as depression (21), anxiety (22, 23) and suicide attempts (24). Moreover, loneliness can have detrimental effects on physical health, e.g., coronary heart disease and stroke (25). All these risks that loneliness can bring make its early identification and prevention a vital concern, especially among vulnerable populations such as PLWHIV during the global pandemic of COVID-19 when the prevalence of loneliness increased than before (26). In order to improve intervention strategies to impose social support, and further alleviate depression and anxiety which may be associated with loneliness confirmed by former studies, and eventually, related downstream health consequences, research to disentangle mechanistic contributors is in great need.

Therefore, our study aimed to investigate the potential mediation mechanism of loneliness between social support and HRQoL in PLWHIV. The risk factors associated with loneliness in PLWHIV and the relationship between loneliness and depression, anxiety, HRQoL were also evaluated. The results of this study will help to understand the role that loneliness played in mental health perspectives and reveal a potential intervention target to improve HRQoL of PLWHIV.

Methods

Study population and design

Participants were recruited from a cohort regularly followed up in Nanfang Hospital, Southern Medical University with a method of randomized sampling. Eligible patients were (1) adults (≥18 years of age), (2) those confirmed to have HIV infection, and (3) had no underlying medical conditions that can interfere with comprehension of questionnaire content. Signed informed consent was obtained from all patients enrolled. All the patients completed the questionnaire surveys in a quiet room without any interference or disruptions. The institutional review board of the Nanfang Hospital has approved the study. A total of 201 patients were enrolled in our study and divided into loneliness and non-loneliness groups based on a UCLA Loneliness Scale cutoff value of 44 points (27). There were 94 patients in the loneliness group and 107 patients in the non-loneliness group. Demographic and clinical data are shown in Table 1.

Laboratory tests and demographic parameters

CD4+/CD8+ T lymphocyte counts were determined with a flow cytometer. HIV RNA was detected by polymerase chain reaction. Demographic and epidemiological information including age, gender, marriage, education, income, fasting, short sleep duration, fitness, alcohol consumption and binge

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Abbreviations: HIV, human immunodeficiency virus; SAS, Self-Rating Anxiety Scale; SDS, Self-Rating Depression Scale; SF-36, Short form health survey of 36 items; SSRS, Social Support Ratio Scale; MSM, Man, who have sex with man; HRQoL, Health Related Quality of Life; UCLA, The University of California, Los Angeles; USA, the United States of America; ART, antiretroviral therapy; SEM, Structural Equation Model; PLWHIV, people living with HIV.

TABLE 1 Baseline characteristics of loneliness group and non-loneliness group.

	Loneliness group	Non-loneliness group	*P*-value
Age (years)	28.17 ± 7.79	27.96 ± 5.92	0.618
Gender			0.344
Male	89	105	
Female	5	2	
CD4 counts	249.25 ± 167.96	274.06 ± 191.72	0.270
CD8 counts	1063.60 ± 765.06	908.59 ± 584.62	0.103
HIV RNA viral load	5.36 ± 6.11	4.83 ± 5.24	0.069
AIDS stages			0.936
Yes	25	29	
No	69	78	
BMI	22.17 ± 18.81	20.69 ± 3.05	0.554
Marriage			0.020
Married	7 (7.69)	20 (19.23)	
Unmarried	84 (92.31)	84 (80.77)	
Education			0.579
Primary	52 (55.32)	55 (51.40)	
Advanced	42 (44.68)	52 (48.60)	
Income			0.471
Low-income	87 (88.42)	94 (92.47)	
High-income	7 (11.58)	11 (7.53)	
Regular fasting			0.550
Yes	24 (25.81)	21 (19.63)	
No	69 (74.19)	86 (80.37)	
Short sleep duration			0.348
Yes	89 (94.68)	98 (91.59)	
No	5 (5.32)	9 (8.41)	
Fitness			0.147
Yes	31 (32.98)	46 (42.99)	
No	63 (67.02)	61 (57.01)	
Alcohol consumption			0.895
Yes	26 (28.26)	30 (29.13)	
No	66 (71.74)	73 (70.87)	
Binge drinking			0.204
Yes	12 (12.90)	8 (7.48)	
No	81 (87.10)	99 (92.52)	
SF-36 scores	616.81 ± 129.22	729.77 ± 81.80	<0.001

drinking were also collected. Education level was defined as follows: primary, if patients received < 9 years of education, and senior, if patients received more than 9 years of education. Income level was defined as follows: high, if the income was more than 240,000 RMB per year, and low, if the income was < 240,000 RMB per year.

Psychological measurements

Loneliness

Loneliness was measured with the UCLA Loneliness Scale Version 3, which consists of 20 questions with answer choices of "Never" (1 point) to "Often" (4 points), with total scores ranging from 20 to 80 (28). The higher the score, the higher the loneliness level. In our study, we considered 44 points as a cutoff value to divide the patients into a loneliness group and a non-loneliness group (27).

Depression

Depression was measured with the Self-Rating Depression Scale (SDS), which was designed by Duke University psychiatrist William W. K. Zung, MD, to assess the level of depression in patients diagnosed with depressive disorder (29). This questionnaire consists of 20 items scored using a 4-point scale, with the main item being the frequency of the defined symptom, based on the following criteria: "1" for no or little time; "2" for a small amount of time; "3" for a considerable amount of time; and "4" for most or all the time. All the scores are summed to determine the total score, which ranges from 20 to 80, and a score under 44 is considered normal without depression. A score of 45–59 is considered mild depression, 60–69 is considered moderate depression, and 70 or more is considered severe depression.

Anxiety

Anxiety was measured with the Self-Rating Anxiety Scale (SAS) (30). The SAS, developed by Zung in 1971, is like the Self-Rating Depression Scale (SDS) in terms of its construction and the way it is rated. The SAS consists of 20 items scored on a 4-point scale, which is the same as the SDS. All the scores are summed to determine the total score. The higher the score is, the more pronounced the tendency to experience anxiety. A score of 50–59 is considered mild anxiety, 60–69 is considered moderate anxiety, and 70 or more is considered severe anxiety.

Social support

Social support was assessed with the Social Support Ratio Scale (SSRS), which was designed by Xiao (31). Social support is divided into 3 categories in this scale: objective support, which is visible or tangible and includes direct material assistance, and the presence and participation of group relationships. The second category is subjective support, which is experienced or emotionally felt by an individual and refers to the emotional experience and satisfaction of being respected, supported, and understood in society and is closely related to an individual's subjective feelings. The final category is the utilization of social support. This scale has 10 items that are summed to determine the final score, which ranges from 0 to 40. The higher the score, the higher the degree of social support an individual receives. A score < 20 indicates that a subject receives only low levels of social support, 20–30 indicates general social support and 30–40 indicates satisfactory social support.

Health-related quality of life

Health-related quality of life (HRQoL) was assessed using the MOS (Medical Outcomes Study) short form health survey (SF-36) (32). The SF-36 is a 36-item, patient-reported survey of patient health. The original SF-36 stemmed from the MOS, which was conducted by the RAND Corporation. It is widely used in the areas of the quality of survival measurements in the general population, and the evaluation of the effectiveness of clinical trials and health policy assessments. As a concise health questionnaire, the SF-36 provides a comprehensive overview of the quality of patient survival in the following nine areas: (1) Physical Function (PF); (2) Role Physical (RP); (3) Bodily Pain (BP); (4) General Health (GH); (5) Vitality (VT); (6) Social Functioning (SF); (7) Role Emotional (RE); (8) Mental Health (MH); and 9 Reported Health Transition (HT). The scores from each area are summed to determine the total score. High scores represent good quality of life. These eight areas can be further divided into two main categories: (1) Physical Component Summary (PCS), including PF, RP, BP, and GH and (2) Mental Component Summary (MCS), including VT, SF, RE, and MH.

Statistical analysis

In our study, we used the mean ± standard deviation, and categorical variables were used to express variables when appropriate. The chi-square test and t-test were used to determine whether the results were significantly different. Univariate and multivariate logistic regression analysis to determine factors related to loneliness among the PLWHIV. Simple linear regression was also used to determine the relationship between UCLA loneliness scale scores and SAS scores, SDS scores, and SF-36 scores which was performed by Pearson's correlation. The significance level was set as $P < 0.05$ (two-tailed). Data analysis and quality control procedures were performed using SPSS 26.0 (Chicago, USA). To further determine the latent mechanism of loneliness in the association between social support and HRQoL, we performed a path analysis with AMOS 25.0 version module (IBM). This was presented by a structural equation model (Figure 3). Standardized regression weights (β coefficients) were reported with their P-values. CMIN (chi-squared test), CMIN/DF, GFI (Goodness of Fit Index), NFI (Normed Fit Index), IFI (Incremental fit index), TLI (Tucker-Lewis's index), CFI (Comparative fit index) and RMSEA (Root Mean Squared Error of Approximation) were used to assess the model fit. CMIN/DF between 1 and 3, GFI, NFI, IFI, TLI, and CFI of $>$ 0.95, and RMSEA < 0.05 indicate good model fit. HOELTER $>$ 200 indicated an adequate sample size.

Results

Demographic data of the enrolled patients

A total of 201 patients were enrolled in this study, 94 of whom were determined to have loneliness and 107 of whom were not. The demographic and clinical characteristics are shown in Table 1. A higher proportion of PLWHIV being married was observed in the non-loneliness group ($P = 0.020$).

Factors related to loneliness in PLWHIV

To determine the related factors associated with loneliness among PLWHIV, we conducted univariate and multivariate analyses. Results from the univariate analysis revealed that being married was an associated factor (OR = 0.350, 95% CI: 0.141–0.872, $P = 0.024$). However, in the multivariate analysis, we found that being married (OR = 0.226, 95% CI = 0.058–0.879, $P = 0.0$ 32) and regularly fasting (OR = 2.524, 95% CI = 0.994–6.409, $P = 0.051$) were independent factors related to loneliness (Table 2).

Depression and anxiety levels among PLWHIV

The depression levels were higher in the loneliness group than the others (57.10 ± 10.12 vs. 46.02 ± 10.50, $P < 0.001$), as shown in Figure 1A. Similar trends were found in anxiety levels in PLWHIV enrolled (52.85 ± 8.61 vs. 42.75 ± 6.79, $P < 0.001$) (Figure 1B). The proportion of patients with depression in the loneliness group was 75.5% compared with 37.4% ($P < 0.001$) in the non-loneliness group (Figure 1C), while the proportion of anxiety in the loneliness group was 52.1% compared with 14.0% ($P < 0.001$) in the non-loneliness group (Figure 1D). Furthermore, we observed that PLWHIV with loneliness had

TABLE 2 Factors associated with of loneliness among people living with HIV.

	Univariate analysis			Multivariate analysis		
	OR	95%CI	*P*-value	OR	95%CI	*P*-value
Age	0.991	0.955–1.028	0.617			
Gender	0.342	0.065–1.808	0.207			
CD4 counts	0.999	0.997–1.001	0.390			
CD8 counts	1.000	1.000–1.001	0.156			
HIV RNA	1.000	1.000–1.000	0.487			
Marriage	0.350	0.141–0.872	0.024	0.226	0.058–0.879	0.032
Education	0.854	0.490–1.490	0.579			
Income	0.696	0.258–1.875	0.473			
Fasting	1.484	0.766–2.874	0.242	2.524	0.994–6.409	0.051
Short sleep duration	1.386	0.767–2.504	0.279			
Fitness	0.653	0.367–1.160	0.146			
Alcohol consumption	0.959	0.515–1.785	0.894			
Binge drinking	1.833	0.715–4.701	0.207			

higher rates of depression and anxiety of all levels than PLWHIV without loneliness (Supplementary Tables S1, S2).

To further evaluated the relationship between loneliness and anxiety or depression in PLWHIV, we conducted correlation analysis. Levels of depression ($r^2 = 0.335$, $P < 0.001$) and anxiety ($r^2 = 0.275$, $P < 0.001$) were significantly positively associated with the level of loneliness, as shown in Figures 1E, F.

Association between social support and HRQoL

The association of perceived social support along with its three dimensions and HRQoL along with its two dimensions were assessed.

The health-related quality of life of PLWHIV was positively correlated with perceived social support ($r^2 = 0.0592$, $P = 0.0005$) and the similar relationship between its two dimensions of mental health ($r^2 = 0.0751$, $P < 0.0001$) and physical health ($r^2 = 0.0229$, $P = 0.0319$) were also determined (Figures 2A–C).

The relation between three dimensions of SSRS scores and SF-36 scale scores on mental health was also assessed. The SSRS scores on objective support ($r^2 = 0.0441$, $P = 0.0028$), subjective support ($r^2 = 0.0600$, $P = 0.0005$) and utilization of support ($r^2 = 0.0377$, $P = 0.0057$) were positively and significantly with SF-36 scale scores on mental health (Figures 2D–F). For physical health evaluated with SF-36 scale scores, it is only significant the relationship with SSRS scores on Subjective Support ($r^2 = 0.0280$, $P = 0.0176$) rather than the other two dimensions (Figures 2G–I).

Association of loneliness and HRQoL in PLWHIV

We next evaluated HRQoL among PLWHIV in the loneliness and non-loneliness groups. The non-loneliness group had higher SF-36 scores in both physical health (336.85 ± 33.52 vs. 300.70 ± 57.36, $P < 0.001$) and mental health (335.95 ± 51.38 vs. 267.44 ± 68.69, $P < 0.001$), as shown in (Figures 3A, B). Levels of HRQoL were significantly and negatively associated with the level of loneliness both in physical health ($r^2 = 0.212$, $P < 0.001$) and mental health ($r^2 = 0.367$, $P < 0.001$) (Figures 3C, D).

Physical aspects of HRQoL, including physical functioning, physical role functioning, bodily pain, and general health perceptions, were found significantly lower in PLWHIV with loneliness, and the psychological aspects of HRQoL, including vitality, social role functioning, emotional role functioning, also had the same relative relationships (Figure 3E).

Mediational mechanism of loneliness

We established a conceptual psychosocial model and confirmed it by Structural Equation Model (SEM) (Figure 4). The perceived social support was negatively associated with loneliness ($\beta = -0.68$, $P < 0.001$). Loneliness was associated with both anxiety ($\beta = 0.53$, $P < 0.001$) and depression ($\beta = 0.27$, $P < 0.001$). Together with perceived social support ($\beta = 0.33$, $P < 0.01$), both loneliness ($\beta = -0.40$, $P < 0.001$) and anxiety ($\beta = -0.51$, $P < 0.001$) were predictable for HRQoL. Moreover, anxiety was related to depression ($\beta = 0.60$, $P < 0.001$) although

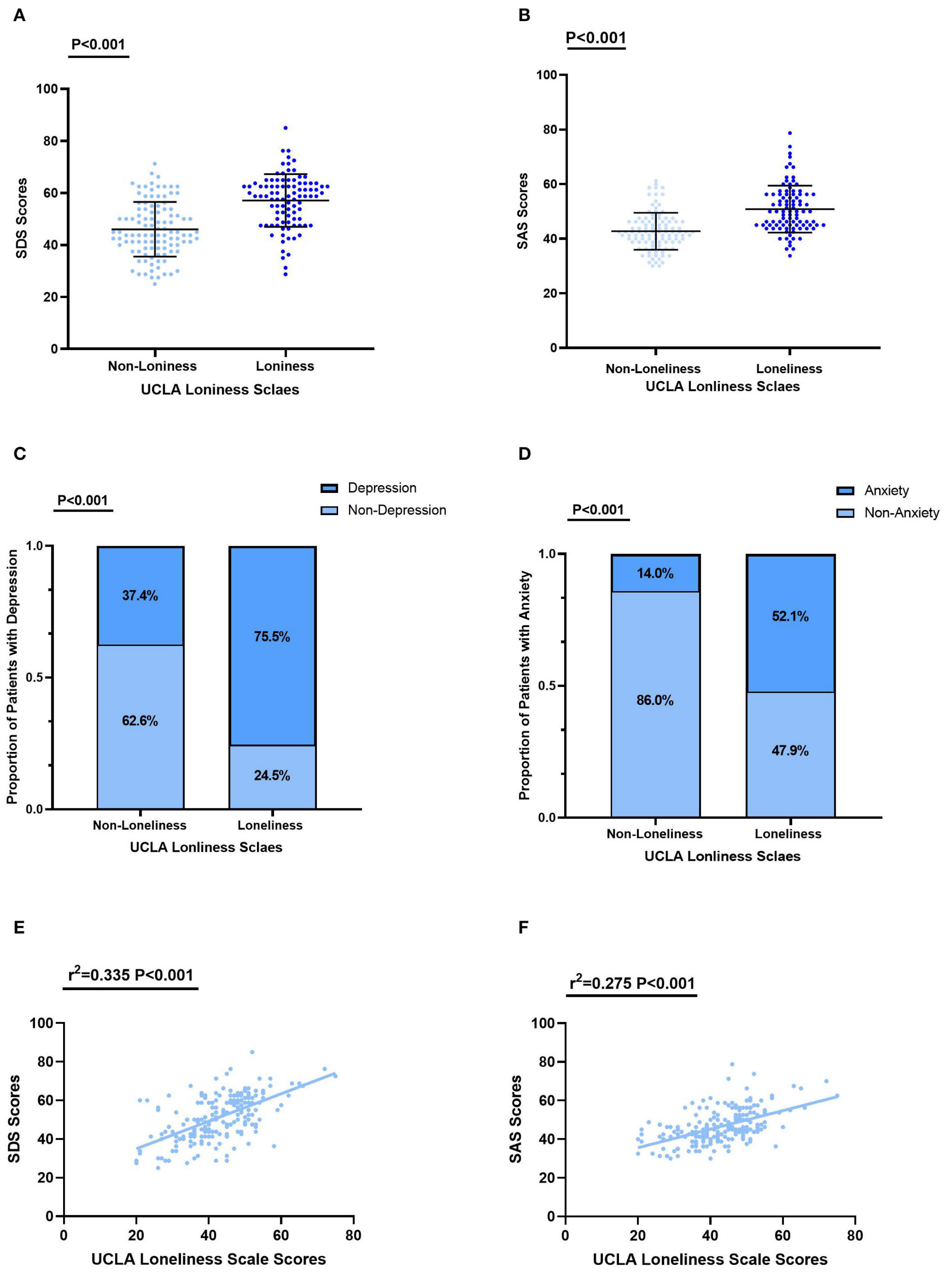

FIGURE 1

Levels of depression and anxiety in the loneliness and non–loneliness groups. **(A)** The depression score of PLWHIV with loneliness were 57.10 ± 10.12, significantly higher than in that without loneliness 46.02 ± 10.50 ($P < 0.001$). **(B)** The depression score of PLWHIV with loneliness were 52.85 ± 8.61, significantly higher than in that without loneliness 42.75 ± 6.79 ($P < 0.001$). **(C)** The proportion of diagnosed with depression was

(Continued)

FIGURE 1 (Continued)
significantly higher in PLWHIV with loneliness than that without loneliness. **(D)** The proportion of diagnosed with anxiety was significantly higher in PLWHIV with loneliness than that without loneliness. **(E)** The relationships between SDS Scores and UCLA Loneliness Scale Scores. **(F)** The relationships between SDS Scores and UCLA Loneliness Scale Scores. SAS, Self–Rating Anxiety Scale; SDS, Self–Rating Depression Scale; UCLA, The University of California, Los Angeles.

depression is not a direct predictor for anxiety ($\beta = 0.05$, $P = 0.846$). The model reflected a good model fit: ($\chi 2$: 20.721; DF:16; $\chi 2$/DF: 1.295; GFI: 0.975; NFI: 0.969; IFI: 0.993; TLI: 0.987; CFI: 0.993; RMSEA: 0.038). The HOELTER was 254 which indicated an adequate sample size.

Discussion

In our study, we performed a cross-sectional study design with PLWHIV consecutively enrolled to manage psychological measurement and to collect information. The PLWHIV were divided into two groups based on their UCLA Loneliness Scale scores. We found the levels of anxiety and depression were significantly different in the two groups. Moreover, there was a correlation observed between perceived social support and HRQoL of PLWHIV. Furthermore, an association between loneliness and HRQoL of PLWHIV was also observed. Based on the findings above, we proposed a hypothesis model where loneliness played a mediation role between social support and HRQoL, which was confirmed by a method of structural equation model in the present study.

We found the incidence of loneliness is 47% in PLWHIV enrolled in our study. This is much higher than that in normal populations, ranging from 9.2% in Southeast Asia to 14.4% in the Eastern Mediterranean region, as reported before (33). For PLWHIV, studies reported that the incidence of loneliness was 58% in the older population in the USA (15) and 27.97% in adults of all ages in China (18). The prevalence of loneliness was 35.5% in PLWHIV who are men who have sex with men (MSM) (34). Our study observed that PLWHIV have a higher incidence of loneliness than the normal population, which was consistent with the result reported by a previous study (35). Moreover, we further observed that being married is an independent factor associated with loneliness. Together with our study, these findings were not beyond daily life experience, especially in the background of COVID-19 pandemic. People are cut off from daily social contact and the deteriorating economy leads to increasing housing and medical burdens (36).

All those findings indicated a potential relationship between PLWHIV's received care and support from society and their quality of life. Thus, we assessed the association between perceived social support and HRQoL along with its two dimensions. A negative correlation between levels of social support and HRQoL was determined. The impact of social support on mental health was especially more pronounced. The results were consistent with a previous study evaluating Chinese PLWHIV (37). Moreover, our study confirmed that loneliness was positively correlated with depression and anxiety. Patients evaluated with loneliness had higher scores on the SDS and SAS than the others, which was consistent with former studies in general populations (38–40). Similar results were previously validated in elderly PLWHIV (15). It was reported that depression in PLWHIV could lead to severe clinical outcomes, including increased mortality and missing scheduled appointments, which may worsen the management of HIV infection (41). Besides, depression and anxiety may decrease ART adherence, as previously reported (42).

We evaluated whether there was a difference in HRQoL between the loneliness and non-loneliness groups. The results showed that there was a negative correlation between loneliness and HRQoL levels. The higher the levels of loneliness, the worse the physical and mental quality of life. The non-loneliness group had better performance than the loneliness group in physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health. A study (15) reported that loneliness among older adults living with HIV was associated with poor HRQoL. Another study (43) confirmed similar results in an older population living with HIV. Our study revealed a more comprehensive and extensive relationship between loneliness and HRQoL in a younger PLWHV population. We found that loneliness could affect nearly every aspect of HRQoL among PLWHIV.

Based on our study, we proposed a hypothesis that loneliness may play a mediation role between perceived social support and poor HRQoL among PLWHIV. A structural equation model was adopted to describe the correlation between psychological variables. We found there was a direct and indirect influence of social support on HRQoL where loneliness acted mediately. A high level of social support predicts a low level of loneliness, which predicts a poor HRQoL in turn. In addition, the findings of the associations between loneliness, anxiety, and depression were also included in the model. However, in our model, together with loneliness, anxiety also predicts a poor level of HRQoL, in which depression did not take a mediating role. This is different from some formerly published studies emphasizing the role of depression (44, 45). It is not definite whether loneliness is more prominent and severe among the PLWHIV in the context of the COVID-19 pandemic that led to this difference, which needs more research to determine.

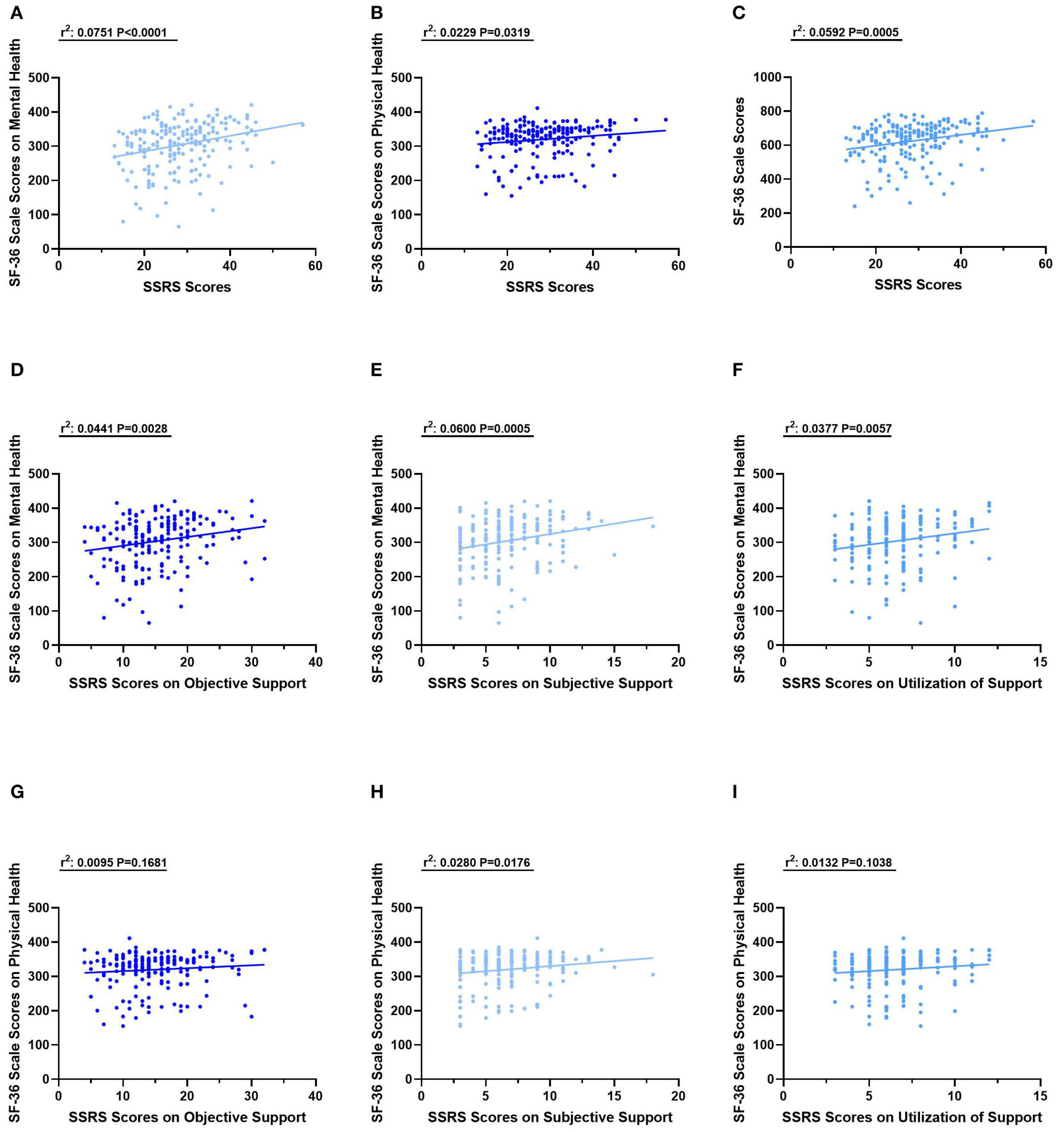

FIGURE 2
The relationships between SSRS scores and SF−36 scores. **(A)** The relationship between SSRS Scores and SF−36 Scores on Mental health. **(B)** The relationship between SSRS Scores and SF−36 scores on Physical health. **(C)** The relationship between SSRS Scores and total SF−36 scores. **(D)** The relationship between SSRS Scores on Objective Support and SF−36 scores on Mental health. **(E)** The relationship between SSRS Scores on Subjective Support and SF−36 scores on Mental health. **(F)** The relationship between SSRS Scores on Utilization of Support and SF−36 scores on Mental health. **(G)** The relationship between SSRS Scores on Objective Support and SF−36 scores on Physical health. **(H)** The relationship between SSRS Scores on Subjective Support and SF−36 scores on Physical health. **(I)** The relationship between SSRS Scores on Utilization of Support and SF−36 scores on Physical health.

The reasons for the development of loneliness varied for the young and elderly populations in China. In our study, we focused on the impact of social support on the loneliness of a young population with an average age of 27 years. For

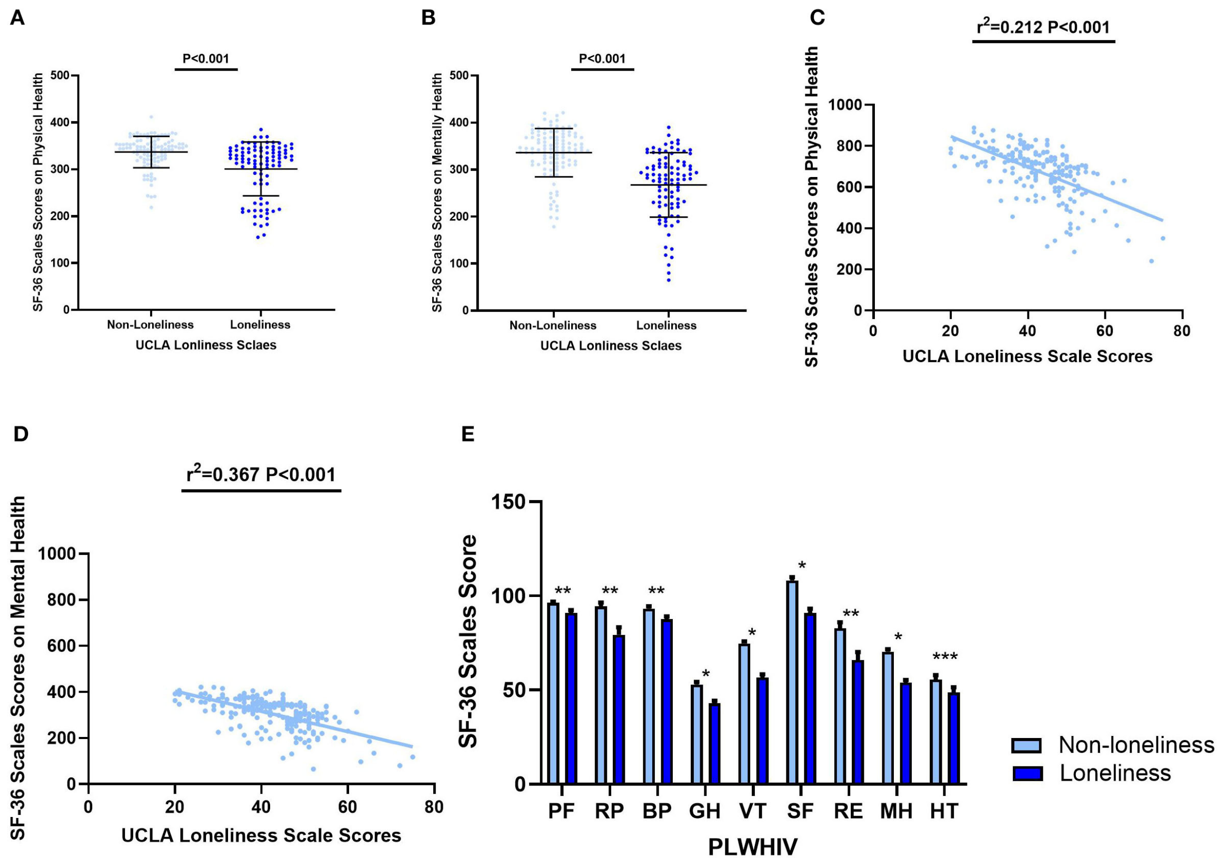

FIGURE 3
Aspects of HRQoL in the loneliness and non−loneliness groups. **(A)** The SF−36 Scale score on physical health of PLWHIV with loneliness were 336.85 ± 33.52, significantly higher than that without loneliness 300.70 ± 57.36 ($P < 0.001$). **(B)** The SF−36 Scale score on mental health of PLWHIV with loneliness were 335.95 ± 51.38, significantly higher than that without loneliness 267.44 ± 68.69 ($P < 0.001$). **(C)** The SF−36 Scale score on physical health was significantly and negatively co−related with UCLA Loneliness Scale scores. **(D)** The SF−36 Scale score on mental health was significantly and negatively co−related with UCLA Loneliness Scale scores. **(E)** Eight aspects of SF−36 Scale scores in two groups. $^{*}P < 0.001$; $^{**}P < 0.05$; $^{***}P > 0.05$. Non−loneliness group vs. non−loneliness group: Mean ± SD. PF: 96.31 ± 6.67 vs. 90.96 ± 14.26; RP: 94.39 ± 20.98 vs. 79.26 ± 39.93; BP: 93.23 ± 11.95 vs. 87.52 ± 11.31; GH: 52.91 ± 14.64 vs. 42.96 ± 12.97; VT: 74.63 ± 12.32 vs. 56.70 ± 15.96; SF: 108.18 ± 18.34 vs. 90.82 ± 22.98; RE: 82.87 ± 31.51 vs. 65.96 ± 41.47; MH: 70.28 ± 14.90 vs. 53.96 ± 13.72; HT: 55.53 ± 25.11 vs. 48.67 ± 27.28. SF−36, 36−Item Short Form Survey Instrument; UCLA, The University of California, Los Angeles; PF, Physical Function; RP, Role Physical; BP, Bodily Pain; GH, General Health; VT, Vitality; SF, Social Functioning; RE, Role Emotional; MH, Mental Health; HT, Reported Health Transition.

children infected with HIV, the factors associated with their loneliness may be stigma, discrimination, and a lack of social support (46). However, in older PLWHIV, the factors associated with loneliness were limited support networks and substance use (15). Combining these results, social support or support networks played a vital role that cannot be ignored. Multivariate analysis indicated, in our study, being married was a protective factor for loneliness. The relationship between being married and loneliness was not reported in PLWHIV before. It is unknown whether being married has a protective effect on loneliness in the USA and the European regions where gay marriage is legal, and this is worth more research. There may be many reasons for this clinical situation. It is studied previously in general population that being married was an important way to access intimate companionship and emotional experiences, which protected individuals from loneliness (47). In older general populations, when family members, friends, and neighbors are lost to death and geographic relocation, marital partners become increasingly important in maintaining a sense of social connectedness (48–50). This is where the importance of social support comes to the forefront and validates the views of a former study (15). We believe the same may hold true for PLWHIV.

Studies have reported that the number of Chinese patients infected with HIV is increasing, especially among young people (51). All patients enrolled in our study were Chinese. One rational speculation is that Chinese people were more likely to place greater importance on

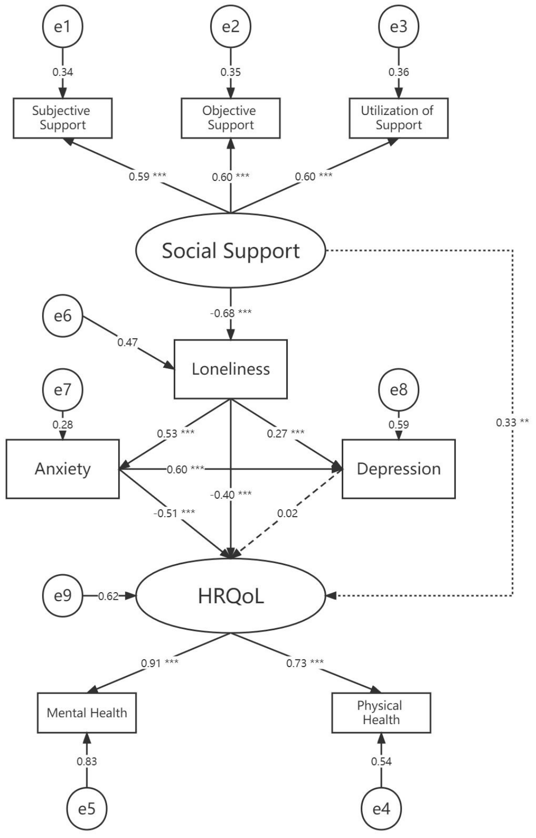

FIGURE 4
Structural equation model for the mediation mechanism of loneliness with standardized beta weights and significant level. ***$P < 0.001$; **$P < 0.01$; Fit statistics: CMIN:20.721; DF:16; CMIN/DF: 1.295; GFI: 0.975; NFI: 0.969; IFI: 0.993; TLI: 0.987; CFI: 0.993; RMSEA: 0.038; HOELTER: 254. HRQoL, Health Related Quality of Life.

stable and healthy family relationships influenced by traditional Chinese culture. However, AIDS is a disease that may bring stigma and discrimination to patients, occurs, the patients become victims of social pressure at the same time. A previous study showed that Chinese PLWHIV lack support from their family, friends, and intimate partners (52). Thus, when considering about improvement of loneliness-mediated HRQoL among PLWHIV, interventions on social support may be an intervention worth considering.

Conclusion

In our study, the prevalence of loneliness was 47% in this population of PLWHIV. Being married is an independent protective factor associated with loneliness in PLWHIV. There was a negative direct and indirect impact of perceived social support on HRQoL where loneliness played a mediation role in this SEM. Besides, PLWHIV with loneliness also had higher levels of anxiety and depression. In the model, together with loneliness, anxiety can predict poor HRQoL. Interventions focused on reducing loneliness or just improving social support for PLWHIV simultaneously may be effective in improving HRQoL among the population.

Limitations

There are some limitations in our study. Its cross-sectional design precludes inferences about causality and limitations exist with interpreting the findings. Although the sample size was sufficient to complete this study by statistical tests, we expect a larger sample size to maintain the stability of the study results. Next, a longitudinal cohort study to further determine the causality of social support and loneliness on HRQoL needs to be performed.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee of Nanfang Hospital, Southern Medical University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

ZQ finished the data analysis and drafted the manuscript. BL finished data collection. GL and HC censored the process. JH, TY, and XX assisted data analyzing. SC and JP designed the study. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2022.1067870/full#supplementary-material

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Prevalence of suicide ideation among HIV/AIDS patients in China: A systematic review and meta-analysis

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Objective: A systematic review and meta-analysis was performed to evaluate the prevalence of suicide ideation among HIV/AIDS patients in China.

Methods: Systematic search of CNKI, Wanfang, China biology medicine database, Weipu, EMBASE, Web of science and PubMed for studies related to the suicide ideation of HIV/AIDS patients. The incidence of suicide ideation of HIV / AIDS patients in China was investigated by meta-analysis.

Results: A total of 16 studies were included (n = 6,174). The incidence of suicidal ideation in HIV/AIDS patients was 30.6% (95%CI: 21.4–39.9%). The results of subgroup analysis showed that the incidence of suicidal ideation in male was 36.1%, which was higher than that in female (32.8%), homosexual patients (39.7%) higher than heterosexual patients (27.1%), 2013–2021 survey (35.2%) higher than 2003–2012 survey (26.5%), the unmarried patients (39.6%) were higher than the married patients (34.5%), the patients diagnosed $>$1 year (28.4%) were higher than the patients diagnosed $<$1 year (27.6%), and the depression patients (34.3%) were higher than patients without depression (20.5%) and CD4 cell counts $\leq$200 cells/ul group (20.6%) were higher than those in $>$400 cells/ul group (19.8%).

Conclusion: The incidence of suicide ideation in HIV/AIDS patients in China is relatively high.

KEYWORDS

acquired immunodeficiency syndrome, HIV/AIDS, suicide ideation, meta-analysis, prevalence

1. Introduction

Acquired immunodeficiency syndrome (AIDS) is an infectious disease caused by Human Immunodeficiency Virus (HIV). As of December 2020, 1.053 million AIDS patients were registered and reported in China (excluding Hong Kong, Macao and Taiwan), and more than 100,000 new HIV-infected patients were reported that year (1). With the increase of AIDS patients, the mental health of AIDS patients has attracted widespread attention of the whole society. As a traumatic and stressful event, HIV infection seriously affects the physical and mental health of patients, making them more prone to depression, anxiety, and even suicide (2–4). Studies have also identified AIDS as a potential predictor of suicidal behavior, and AIDS patients have a higher incidence of suicidal ideation than the general population (5, 6). Over time, some domestic studies have found that the incidence of suicidal ideation in AIDS patients ranges from 1.03 to 57.14% (7–11). In recent decades, the implementation of prevention and control policies and economic and social development in different regions have affected the mental health status of local AIDS patients, and the differences in the sample size of different surveys and the individual differences of the survey subjects have affected the performance of various studies. Therefore, this study adopts the Meta-analysis method to comprehensively analyze the prevalence of suicidal ideation among HIV/AIDS patients in China, with the aim to provide a scientific basis for formulating relevant policies and plans.

2. Methods

2.1. Studying retrieval

Retrieval databases include Chinese databases: CNKI, China Biology Medicine Database (CBM), Wanfang and Weipu; English databases: Web of Science, PubMed and Embase. The database was searched for "AIDS" or "acquired immunodeficiency syndrome" or "HIV", "suicide" or "suicidal ideation", "suicide" or "suicidal ideation", "incidence" or "prevalence" and "China" by subject headings, abstracts, titles (or article titles) and keywords for Chinese databases and MeSH vocabulary and free words for English databases, and the retrieval time was set from 2003 to 2021. Besides, the study traceability method was applied to further search.

2.2. Screening and data extraction

Inclusion criteria: cross-sectional study from China; age $\geq$ 18 years old; with clear number of samples ($\geq$25); the basis of suicidal ideation is clearly recorded.

Exclusion criteria: repeated publication or incomplete information; unreasonable research design and statistical methods; review or expert commentary.

Studying retrieval was carried out according to the retrieval strategy, and two researchers conducted preliminary screening of the retrieved studies, and then read the full text for secondary screening to determine the included studies according to the inclusion and exclusion criteria. Studies with different opinions were judged by a third researcher. Data were extracted according to a unified table, including the first author, publication year, study area, sample source, age range, sample size, incidence of suicidal ideation, etc. Suicidal ideation was defined as the presence of suicidal thoughts or suicidal intent.

2.3. Quality evaluation

The quality was scored using the AHRQ (Agency for Healthcare Research and Quality) cross-sectional study quality evaluation list (including a total of 11 items) (9). 0–3 points were identified as low quality, 4–7 points were medium quality, and 8–11 points were high quality (10). Two researchers evaluated the included studies according to the AHRQ cross-sectional study quality evaluation list. If there was any inconsistency, a third person was asked to evaluate again to avoid the different quality evaluation results.

2.4. Statistical analysis

Stata12.0 software was used for heterogeneity test. If the heterogeneity test $I^2 < 50\%$, it was considered that there was moderate or low degree of heterogeneity, so the fixed effect model was used for analysis; if $I^2 \geq 50\%$, the random effect model was applied for analysis. Subgroup analysis was used to evaluate differences in gender, sexual orientation, year of investigation, marital status, time of diagnosis, history of depression and CD4 cell count. Sensitivity analysis was conducted by excluding individual studies to observe changes in the results. If the results do not change much, it indicated that the results were relatively stable. Publication bias analysis was assessed using Egger's test and funnel plots. For all statistical tests, $P < 0.05$ was considered statistically significant.

3. Results

3.1. Basic features

The initial search yielded 667 studies (including 62 English studies), which were screened according to the inclusion and exclusion criteria. A total of 16 studies were finally selected, including 12 in Chinese and 4 in English, as shown in Figure 1. The total sample size included in this study was 6 174 people, with a variation range of 28-1 276 ($M = 278$). Among the studies included in this study, 5 are of high quality, 10 are of medium quality and 1 is of low quality (see Table 1).

3.2. The incidence of suicidal ideation in HIV/AIDS patients

According to the results of the heterogeneity test, there was obvious heterogeneity ($I^2 = 99.3\%$, $P < 0.05$). Therefore, the random effects model was used in this study. The incidence of suicidal ideation in Chinese HIV/AIDS patients was 30.6% (95%CI: 21.4∼39.9%) (see Figure 2).

3.3. Subgroup analysis

The incidence of suicidal ideation in male was 36.1% (95%CI: 29.1–43.2%), which was higher than that in females (32.8% (95%CI: 22.0–43.6%); the incidence of suicidal ideation in homosexual patients was 39.7% (95%) CI: 32.3–47.1%), higher than that in heterosexual patients 27.1% (95% CI: 22.1–32.1%); 35.2% (95%CI: 26.8–43.5%) in 2013–2021 and 26.5% (95%CI: 18.0–35.0%) in 2003–2012, indicating the incidence of suicidal ideation with an upward trend. The incidence of suicidal ideation in unmarried patients (39.6%, 95%CI: 27.8–51.3%) was higher than that in married patients (34.5%, 95%CI: 25.1% ∼43.9%); the incidence in patients diagnosed >1 year was 28.4% (95%CI: 23.9% ∼33.0%), slightly higher than that in patients <1 year (27.6% (95%CI: 95%CI: 9.3% ∼45.9%). Compared with non-depressive patients (20.5%, 95%CI: 17.7% ∼23.3%), depressive patients (34.3%, 95%CI: 25.1% ∼43.6%) was more likely to have suicidal ideation. The incidence of suicidal ideation in the CD4 cell count $\leq$ 200 cells/ul group was

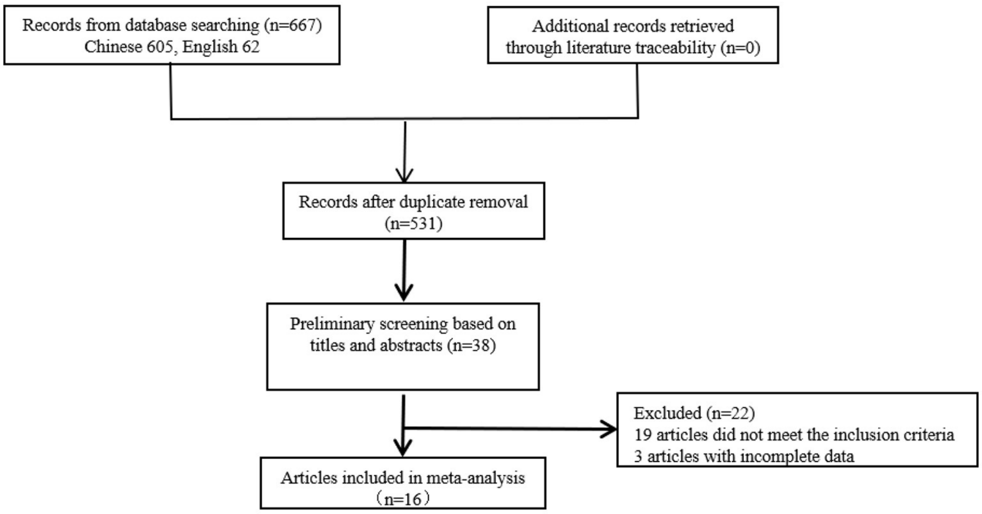

FIGURE 1
Flow chart of study selection in the meta-analysis.

TABLE 1 Characteristics of the included studies.

No.	Author	Year	Region	Age	Incidence of suicidal ideation (%)	Quality evaluation
1	Yu X et al. (11)	2006	Beijing, Anhui	18–50	16 (57.14)	High
2	Wu HY et al. (12)	2007	Anhui	24–67	82 (46.86)	Modern
3	Zhang XQ et al. (13)	2010	Hunan	20–52	32 (18.82)	Low
4	Lau JTF et al. (14)	2010	Central	18	60 (34.09)	Modern
5	Liang SY et al. (15)	2012	Henan	19	36 (3.19)	Modern
6	Wu DL et al. (7)	2014	Beijing	14–79	3 (1.03)	Modern
7	Qin XJ et al. (16)	2014	Guangdong	20	42 (29.17)	Modern
8	Zhang HX et al. (17)	2016	Guangzhou	21	134 (32.84)	Modern
9	Wu YL et al. (18)	2016	Anhui	18–62	57 (30.98)	Modern
10	Wang HY et al. (19)	2017	Hunan	9–72	137 (27.18)	Modern
11	Wang W et al. (20)	2018	Jiangsu	18–77	147 (31.61)	High
12	Zen CB et al. (21)	2018	Guangzhou	20–76	133 (32.36)	High
13	Liu Y et al. (22)	2019	Jiangxi	20–59	34 (40.00)	Modern
14	Liu Y et al. (23)	2019	Guangzhou	18–80	81 (17.46)	Modern
15	Yu Y et al. (8)	2021	Guangxi	18	692 (54.23)	High
16	Yang ZJ et al. (24)	2021	Shenzhen	18–65	105 (39.92)	High

27.3% (95%CI:6.3–48.4%), which was slightly higher than that in the CD4 cell count >400 cells/ul group (18.2%, 95%CI:4.4–31.9%) (see Table 2).

3.4. Bias and sensitivity analysis

It was found that the symmetry was general through funnel plot, and Egger's test showed $t = 1.08$, $P = 0.19$, indicating that there was no publication bias. After excluding any studies in the sensitivity analysis, the overall results did not change significantly, confirmed the stability of the serious results.

4. Discussion

Suicidality and HIV/AIDS are currently two major public health issues of widespread concern, which are more prominent in developing countries (25). There are currently more than 1

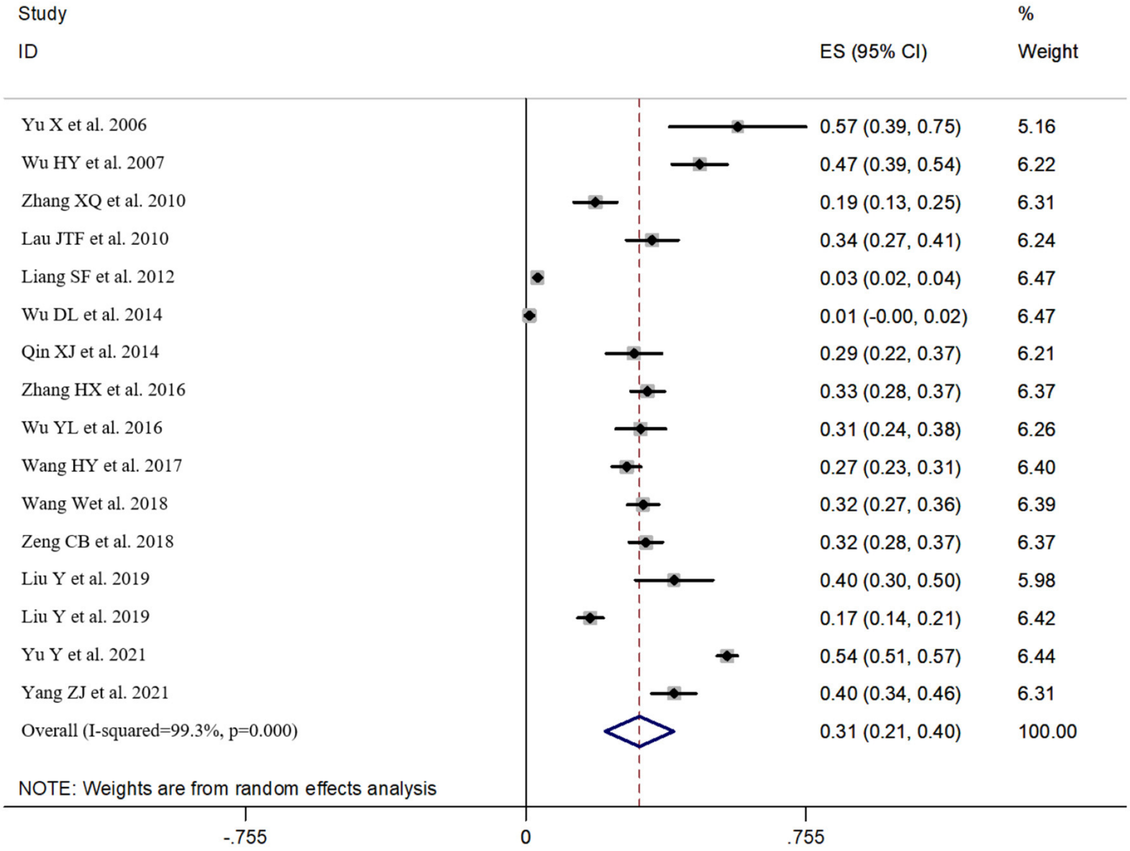

FIGURE 2
Forest map of meta-analysis of the incidence of suicidal ideation in Chinese HIV/AIDS patients.

million AIDS patients in China, and there will be 135,000 new HIV-infected patients in 2020. Due to the lack of awareness of the disease and discrimination in the social environment after HIV infection, most patients will have a strong sense of stigma (26), which lead to anxiety and depression (27), even extreme behaviors such as suicide (28). This study found that the incidence of suicidal ideation in HIV/AIDS patients in China was 30.6% (95%CI: 21.4–39.9%), which was significantly higher than that in the general Chinese population of 3.9% (95%CI: 2.5–6.0%) (29), but lower than Nigeria (33.6%) (5) and Ethiopia (33.6%) (30). The differences among different studies may be related to ethnicity, region, economic and cultural issues, social support and acceptance, and awareness of HIV/AIDS.

The subgroup analysis found that the incidence of suicidal ideation in males was higher than in females, and the results were consistent with the studies by Kelly B et al. (31) in Switzerland and Zen CB et al. (21) in China. However, studies by Oladeji BD et al. (32) in Nigeria and Carrieri MP (33) in the United States found that the suicide risk of female patients was higher than that of males. Some studies have also reported that suicide risk was not related to gender (34). This may be because of the difference between social backgrounds of different countries, the moral requirements for men and women are also inconsistent, the social discrimination and psychological pressure are not the same. In China, most men bear the burden of economic and family care (35). The HIV infection led to the discrimination against by society, fixed economic income will be disrupted to increase the risk of suicide (34). This study found that the incidence of suicidal ideation in HIV/AIDS patients with different sexual orientations was significantly different, with the incidence of suicidal ideation in homosexual patients was 39.7% (95%, CI: 32.3–47.1%), higher than that in heterosexual patients 27.1% (95% CI: 22.1–32.1%). Compared with heterosexuals, homosexuals suffer from external discrimination and bear heavier psychological pressure. In the general population, homosexuals have a higher suicide risk than heterosexuals, which was consistent with previous domestic studies (1). Zhang et al. (1) showed that over time, with the development of time, the number of deaths of newly discovered HIV infected patients had decreased, and the suicide rate had also decreased year by year, which is in line with the positive results since the implementation of the “four exemptions and one assistance” policy of China, which included the provision of antiviral drugs for free, free consultation and preliminary screening, free mother-infant blocking drugs and infant detection reagents for infected pregnant women, exempted school fees for orphans of AIDS patients and strengthen the publicity of AIDS prevention knowledge (36). However, this study found that the incidence of suicide ideation among people with HIV/AIDS in China in 2013–2021 was higher than that in 2003–2012, which may be because of the increased social pressure from study, life

TABLE 2 Meta-analysis of the incidence of suicidal ideation in various subgroups of Chinese HIV/AIDS patients.

Factors	No.	Sample size	No. of suicidal ideation	I^2 (%)	*P*	Pooled incidence (%)	95% CI
Gender							
Male	10	3 509	1 442	94.4	<0.05	36.1	29.1∼43.2
Female	8	577	191	87.7	<0.05	32.8	22.0∼43.6
Sexual orientation							
Homosexual	6	859	333	80.6	<0.05	39.7	32.3∼47.1
Heterosexual	6	1 086	285	68.8	<0.05	27.1	22.1∼32.1
Survey year							
2003–2012	7	2 114	317	98.5	<0.05	26.5	18.0∼35.0
2013–2021	9	4 060	1 549	96.8	<0.05	35.2	26.8∼43.5
Marital status							
Married	7	1 281	452	92.6	<0.05	34.5	25.1∼43.9
Unmarried	7	2 105	937	96.3	<0.05	39.6	27.8∼51.3
Diagnosis time							
≤ 1 year	6	1 022	249	98.4	<0.05	27.6	9.3∼45.9
>1 year	4	750	221	44.0	0.15	28.4	23.9∼33.0
Depression							
Yes	5	726	346	93.9	<0.05	34.3	25.1∼43.6
No	5	806	166	<0.05	0.84	20.5	17.7∼23.3
CD_4 cell count							
≤ 200 cells/ul	4	463	130	97.4	<0.05	27.3	6.3∼48.4
>400 cells/ul	4	352	63	95.3	<0.05	18.2	4.4∼31.9

and employment, which will aggravate the appearance of self-abuse thoughts, especially for HIV/AIDS patients (20, 37). Unmarried HIV/AIDS patients were found with higher suicidal ideation than married patients. Compared with married patients, unmarried patients often lacked family support and care, which may lead to more stress, depression, anxiety and suicide ideation (16, 18). In terms of time to diagnosis, we found that the incidence of suicidal ideation in patients diagnosed >1 year was slightly higher than that in patients ≤ 1 year, while other studies have shown that suicidal ideation and suicidal behavior were more likely to occur soon after HIV infection was diagnosed, the incidence of suicidal ideation will be decreased with more adaptation time and social support (1, 18). The incidence of suicidal ideation in patients with a history of depression was much higher, since mental health problems can increase the risk of suicide. A domestic study confirmed that the suicide risk of AIDS patients with depression was 3.7 times that of patients without depression (38). Related reports (39) showed that depression was an independent risk factor for suicide in AIDS patients. Patients with low CD4 cell counts have a higher incidence of suicidal ideation than these with high CD4 counts. Studies have confirmed that the more the number of CD4 cells in patients, the less damage to the immune system, and the lower the incidence of suicide (40). This may be because the patients were in different disease courses, and the risk of suicide was different. Due to various infections and side effects of anti-HIV treatment, the immune system will be severely damaged, the CD4 cell count will be decreased, and the quality of life will be decreased, resulting in suicidal ideation, or even suicidal behavior (40).

The advantage of this study is that it systematically assessed the occurrence of suicidal ideation among HIV/AIDS patients in China, and provided new thinking and scientific basis for the formulation of psychological intervention policies and prevention and control priorities for AIDS patients. There were still several deficiencies in this study: (1) Due to the lack of a unified measurement scale for suicide in AIDS patients, a unified standard cannot be used to assess suicidal ideation, and there is information bias and selection bias; (2) This study also did not explore the effects of other co-morbid mental disorders and the impact of major emergencies in life on patients.

5. Conclusion

The incidence of suicide ideation in HIV/AIDS patients in China is relatively high. In order to effectively reduce the suicide risk of HIV/AIDS patients, relevant government departments should strengthen the level of AIDS-related knowledge and further enhance the level of social support for people with HIV/AIDS. Policy makers should strengthen the cooperation between the Centers for Disease Control and Prevention and specialized mental health medical institutions, and highlight mental health education and psychological crisis intervention services on the basis of "four exemptions and one assistance", so as to improve the quality of life of HIVAIDS patients and reduce the risk of suicide.

Data availability statement

The dataset generated and analyzed during the current study could be available from the corresponding authors on reasonable request.

Author contributions

Study design: SL and HZ. Analysis and interpretation of data: YJia, QY, JY, and YJi. Drafting of the manuscript: SL and YJia. Critical revision of the manuscript: SY and HZ. Approval of the final version for publication: All authors. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Association between depression and HIV infection vulnerable populations in United States adults: a cross-sectional analysis of NHANES from 1999 to 2018

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Background: Although the government has made a commitment to advance education on HIV disclosure, depression continues to play a significant role in whether people living with HIV (PLWH) choose to disclose their HIV status to families or friends. Vulnerable populations who are at risk of contracting HIV may also be more susceptible to mental illness. However, there is a limited understanding of the association between depression and vulnerable populations affects by HIV among United States adults. We aimed to explore the incidence of depression in the HIV infection vulnerable populations and assessed the association between the HIV infection vulnerable populations and depression.

Methods: We analyzed the most current statistics from the National Health and Nutrition Examination Survey (NHANES) that included 16,584 participants aged 18 years or older between 1999 and 2018. The Patient Health Questionnaire-9 (PHQ-9) was used to evaluate symptoms of depressive disorder. Demographic characteristics were compared between the HIV infection vulnerable groups and HIV infection low-risk groups. Multivariable logistic regression analysis was also carried out to evaluate the odds rate and association between the HIV infection vulnerable populations and depression.

Results: Based on the most recent statistics from NHANES, HIV infection vulnerable populations were male, younger, less married or living together, non-Hispanic White people, lower income, and lower body mass index (BMI), with higher levels of cigarette smoking, alcohol drinking, a higher prevalence of depression, lower prevalence of hypertension and diabetes mellitus (DM; $p<0.05$). Additionally, individuals with severe depression had a higher prevalence of cardiovascular disease (CVD), hypertension, DM, chronic kidney disease (CKD), and a higher proportion of HIV infection vulnerable populations and less married or living together ($p<0.01$). Finally, the odds of depression from the logistic regression were significantly increased in HIV infection vulnerable groups ($p<0.01$).

Conclusion: Depression might be associated with HIV infection vulnerable populations in the United States adults. More research is needed to evaluate the association between HIV infection vulnerable populations and depression and explore their causal associations. In addition, prevention efforts focusing on HIV disclosure and HIV infection vulnerable populations in the United States should address common co-prevalent depression to reduce new HIV infections.

KEYWORDS

HIV, depression, HIV infection vulnerable populations, HIV disclosure, NHANES

Introduction

Vulnerable populations with human immunodeficiency virus (HIV) infections have experienced more high-risk HIV behaviors, which cause morbidity, mortality, and disability in the United State (1–3). These groups reported higher rates of substance use, alcohol abuse, smoking, avoidant health behavior, condomless sex, being Black/African American, gay and sex workers, and with less income and other affective disorders than the normal populations (1, 4–6). They also have poor mental health and a low socioeconomic status (1, 7). Therefore, HIV infection vulnerable populations may suffer long-term health concerns in the future, especially when infected with HIV.

With the significant advancements in the preclusion and the modern combination of antiretroviral therapy (ART), HIV infection had become a chronic complaint with an ordinary life expectancy in developed countries. The prevalence of new HIV-infected individuals has decreased, and the number of people living with HIV (PLWH) has not markedly increased over the past decade (1, 8). Globally, more than 37.9 million experienced HIV infection, and in the United States, the number of PLWH increased by 33% from 0.80 million (2009) to 1.02 million (2018) (9, 10). Despite the indication that HIV infection carries a higher risk of developing depression, the mechanisms responsible for the increased risk have not been completely documented. Nonetheless, previous studies had focused only on HIV infection and the use of antiretroviral treatment substances for noninfectious diseases (9).

Depression, a kind of mental health problem represented by various symptoms, including low mood or energy, lack of interest or concentration, anxiety, guilt, and changes in appetite and psychomotor activity. Depression is a significant reason for suicide and disease burden, and is recognized as an obstacle to implementing antiretroviral therapy (ART) for PLWH, increasing the spread of HIV and sexually transmitted diseases (6, 11–14). It is still plays an important role in whether PLWH decides to disclose their HIV status to families or friends (15). The current epidemiological research shows that adverse mental health conditions increase the risk of HIV infections (16). In addition, previous studies have explored the social conditions and the diseases in order to investigate the association between HIV high-risk behaviors and depression in specific population such as men who had sex with men (MSM), transgender women, sex workers, etc., and found that increasing HIV high-risk behaviors was associated with depression (2, 6, 16–18). However, limited studies have estimated the association between depression and HIV infection in vulnerable populations, especially in the United States (19, 20). This cross-sectional survey aimed to review and evaluate the association between depression and the HIV infection vulnerable populations in the United States by adopting statistics from the NHANES from 1999 to 2018.

Materials and methods

Study population

The NHANES is managed by the Centers for Disease Control and Prevention to assess the health of the United States population adopting a representative population sample of United States civilian community residence members, adopting a complex, multistage, possibility-sampling plan. The research was conducted regularly before 1999 and continuously after that. Elements of data collection and the survey design have been formerly represented (21). Among 60,936 participants, the analysis excluded those with uncertain or no information on the risk of HIV infection, information on PHQ-9, and those under 18 years old. Finally, 16,584 participants from NHANES were included (Figure 1). This study was based on secondary data analysis that was shortened by personal identifiers and did not require institutional review. Interviews were conducted to gather information on factors that increase the risks related to HIV acquisition and transmissions such as unprotected sexual behaviors involving rectal or urethral contact, self-reported history of sexually transmitted diseases, injected substance use, and adverse mental health conditions. Therefore, only individuals aged 18 years or older who had not been infected with HIV were included in this research, representing United States adults.

Data collection

In every 2 years survey, participants completed in-house interviews and went to a mobile testing center that they replied to extra questionnaires and underwent physical inspection and blood sample gathering. A standardized survey was adopted to collect data on age, gender, race/ethnicity, BMI, family income-to-poverty ratio (PRI), smoking status, alcohol drinking status, education level, and self-reported history of depression, hypertension, CVD, CKD, and DM (22). Age and BMI were defined as continuous variables. Categorical variables were as follows: race/ethnicity (Mexican American, non-Hispanic White, non-Hispanic Black, other Hispanic, or other), sex (male, female), PRI (<130%, 130–350%, or > 350%), marital status (never married, married or living together, and widowed/divorced/separated), education status (high school or less, more than high school), alcohol drinking status (former drinking, heavy drinking, moderate drinking, mild drinking, or never drinking), history of hypertension (no, yes), history of CVD (no, yes), history of CKD (no, yes), and history of DM (no, diabetes mellitus, impaired fasting glucose, and impaired glucose tolerance).

In addition, the PHQ-9 was applied to assess depressive status during the face-to-face interviews (23). These nine symptoms were (a) anhedonia, (b) depressed emotion, (c) sleep trouble, (d) fatigue, (e) changes in appetite, (f) low self-esteem, (g) concentration troubles, (h) psychomotor problems, and (i) suicidal thoughts. Each symptom item in PHQ-9 was scored on a 0–3 calibration, from 0 ("not any") to 3 ("almost every day"). The entire score ranged from 0 to 27, with scores ≥10 symbolizing clinically meaningful depressive symptoms. Furthermore, this study classified participants into the following five groups based on their total scores: 0–4 (no depression), 5–9 (mild depression), 10–14 (moderate depression), 15–19 (moderately severe depression), and 20–27(severe depression) (24, 25). The PHQ-9 is proven to measure depressive symptom severity (26), and the total score was evaluated as a constant variable to further confirm the results.

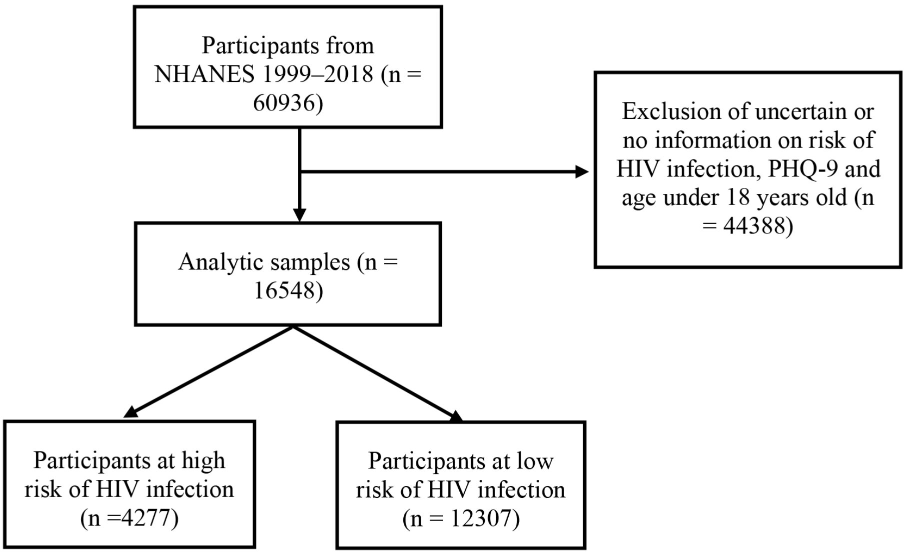

FIGURE 1
Flow chart of study participants. Sample selection and exclusion criteria for comparing high-risk of HIV infection and low-risk of HIV infection participants. NHANES, National Health and Nutrition Examination Survey; PHQ-9, the patient health questionnare-9.

The NHANES gathers information on the risk behaviors of HIV acquisition and transmission; the risk behaviors including condomless sex, anal intercourse, self-reported history of sexually transmitted diseases, injected substance use, and adverse mental health conditions. Participants were defined as HIV infection vulnerable groups base on if they had any one of the following high-risk behaviors: multiple sex partners in the last year, self-reported diagnoses of any sexually spread infections (such as gonorrhea, genital warts, genital herpes, and chlamydia), and drug addicts (7, 27, 28). The rest participants were classified as the HIV infection low-risk group.

Statistical analysis

According to the NHANES statistical analysis guidelines, all analyses were applied to weighted samples and considered the design's stratification and clustering to derive assessments that applied to United States adults. In descriptively statistical analysis, constant variables were demonstrated in the mean and SD, and categorical variables were depicted in the form of frequency and percentage. The *t*-test and chi-squared test compared mean values and categorical variables, respectively. In addition, multiple logistic regression models evaluated the associations between depression and the HIV infection vulnerable populations after adjusting demographic covariates and a history of chronic diseases. Model 1 adjusted for sex and age; Model 2 additionally adjusted for poverty income ratio status, race/ethnicity, BMI, smoking, marital status and drinking status; and model 3 further adjusted for history of CVD, hypertension, DM, and CKD. This research assessed adjusted odds ratios (ORs) for depression according to HIV risk status to evaluate the possible association between depression and HIV risk status. All statistical analyses were performed for sampling weights using R software (version 4.1), with value of p not more than 0.05.

Results

Population characteristics by depression categories

This study included 60,936 individuals from the NHANES database (1999–2018). After excluding participants without information on the risk of HIV infection, information on PHQ-9, and age under 18 years old, the analysis included 16,584 individuals, of which 1,609 (9.7%) had clinically significant depressive symptoms. They were then divided into two groups: (i) HIV infection low-risk groups ($n = 12{,}307$) and (ii) the HIV infection vulnerable groups ($n = 4{,}277$; Figure 1). Participants were classified into five groups to assess the correlation between depression and HIV infection vulnerable populations. These were no depression, mild depression, moderate depression, moderately severe depression, and severe depression groups (Table 1). Relative to lower PHQ-9 scores groups, individuals with moderately severe depression and severe depression groups were older, with 73.2% and 70.3% female. These two groups had predominantly non-Hispanic White people, with less income, less education, less married or living together, higher BMI, and higher smoking and alcohol drinking rates ($p < 0.01$). In addition, individuals in moderately severe depression and severe depression groups had a higher prevalence of CVD, hypertension, CKD and DM. They also occupied a higher proportion of the HIV infection vulnerable populations ($p < 0.01$).

Population characteristics by HIV risk status

Among the participants, 4,277 (25.8%) were at a high risk of HIV infection (Table 2). Compared with the HIV infection low-risk populations, the HIV infection vulnerable populations were more

TABLE 1 Characteristics of participants by depression categories in the National Health and Nutrition Examination Survey (NHANES), 1999–2018.

Characteristics	No depression	Mild depression	Moderate depression	Moderately severe depression	Severe depression	*p* value	*p* trend[#]
	N=12,221	*N=2,754*	*N=988*	*N=429*	*N=192*		
Age, years, mean (SD)	37.8 (11.8)	37.8 (12.2)	38.9 (12.1)	40.9 (11.7)	42.9 (10.8)	<0.001	<0.001
Gender, *N* (%)						<0.001	0
Female	6,786 (55.5%)	1,775 (64.5%)	696 (70.4%)	314 (73.2%)	135 (70.3%)		
Male	5,435 (44.5%)	979 (35.5%)	292 (29.6%)	115 (26.8%)	57 (29.7%)		
HIV risk status, *N* (%)						<0.001	0
HIV high risk	2,842 (23.3%)	878 (31.9%)	336 (34.0%)	144 (33.6%)	77 (40.1%)		
HIV low risk	9,379 (76.7%)	1,876 (68.1%)	652 (66.0%)	285 (66.4%)	115 (59.9%)		
Family income-to-poverty ratio, *N* (%)						<0.001	0
<130%	3,299 (29.0%)	1,013 (39.4%)	481 (51.9%)	229 (56.7%)	102 (58.0%)		
>350%	4,047 (35.6%)	605 (23.6%)	143 (15.4%)	48 (11.9%)	20 (11.4%)		
130 to <350%	4,026 (35.4%)	951 (37.0%)	302 (32.6%)	127 (31.4%)	54 (30.7%)		
Race and ethnicity, *N* (%)						<0.001	<0.001
Non-Hispanic white	4,850 (39.7%)	1,124 (40.8%)	418 (42.3%)	192 (44.8%)	88 (45.8%)		
Non-Hispanic black	2,647 (21.7%)	614 (22.3%)	241 (24.4%)	92 (21.4%)	36 (18.8%)		
Mexican American	2,129 (17.4%)	459 (16.7%)	137 (13.9%)	63 (14.7%)	18 (9.38%)		
Other Hispanic	1,177 (9.63%)	286 (10.4%)	118 (11.9%)	57 (13.3%)	35 (18.2%)		
Other	1,418 (11.6%)	271 (9.84%)	74 (7.49%)	25 (5.83%)	15 (7.81%)		
Marital status, *N* (%)						<0.001	0
Married/living together	7,492 (64.5%)	1,409 (54.4%)	455 (48.1%)	179 (43.2%)	83 (43.9%)		
Never married	2,611 (22.5%)	688 (26.6%)	248 (26.2%)	105 (25.4%)	40 (21.2%)		
Widowed/divorced/separated	1,511 (13.0%)	492 (19.0%)	243 (25.7%)	130 (31.4%)	66 (34.9%)		
Education, *N* (%)						<0.001	0
High school or less	4,955 (40.5%)	1,346 (48.9%)	531 (53.7%)	253 (59.0%)	118 (61.5%)		
More than high school	7,266 (59.5%)	1,408 (51.1%)	457 (46.3%)	176 (41.0%)	74 (38.5%)		
BMI, kg/m^2, mean (SD)	28.6 (6.85)	30.0 (8.10)	30.5 (8.69)	32.0 (9.34)	31.8 (8.32)	<0.001	<0.001
Cerebrovascular disease status, *N* (%)						<0.001	0
No	11,304 (97.3%)	2,430 (93.8%)	858 (90.6%)	352 (85.0%)	152 (80.4%)		
Yes	316 (2.72%)	160 (6.18%)	89 (9.40%)	62 (15.0%)	37 (19.6%)		
Hypertension status, *N* (%)						<0.001	0
No	9,316 (76.2%)	1,908 (69.3%)	626 (63.4%)	237 (55.2%)	95 (49.5%)		
Yes	2,905 (23.8%)	846 (30.7%)	362 (36.6%)	192 (44.8%)	97 (50.5%)		
Diabetes mellitus status, *N* (%)						<0.001	0
Diabetes mellitus	1,071 (9.06%)	329 (12.4%)	154 (16.1%)	72 (17.1%)	45 (23.8%)		
Impaired fasting glucose	385 (3.26%)	93 (3.51%)	24 (2.52%)	9 (2.14%)	6 (3.17%)		
Impaired glucose tolerance	403 (3.41%)	98 (3.70%)	31 (3.25%)	21 (4.99%)	9 (4.76%)		
No	9,959 (84.3%)	2,132 (80.4%)	745 (78.1%)	319 (75.8%)	129 (68.3%)		
Chronic kidney diseases status, *N* (%)						<0.001	<0.001
No	10,691 (91.8%)	2,348 (89.1%)	831 (87.4%)	343 (85.1%)	153 (83.6%)		
Yes	957 (8.22%)	287 (10.9%)	120 (12.6%)	60 (14.9%)	30 (16.4%)		
Smoking status, *N* (%)						<0.001	0
No	9,526 (80.0%)	1,826 (68.8%)	555 (57.4%)	222 (52.9%)	92 (48.2%)		
Yes	2,377 (20.0%)	830 (31.2%)	412 (42.6%)	198 (47.1%)	99 (51.8%)		

(Continued)

TABLE 1 (Continued)

Characteristics	No depression	Mild depression	Moderate depression	Moderately severe depression	Severe depression	*p* value	*p* trend#
	N=12,221	*N*=2,754	*N*=988	*N*=429	*N*=192		
Alcohol drinking status, *N* (%)						<0.001	0
Former drinker	1,458 (12.1%)	381 (14.1%)	166 (17.0%)	82 (19.4%)	40 (20.8%)		
Heavy drinker	3,103 (25.7%)	843 (31.2%)	311 (31.8%)	129 (30.5%)	74 (38.5%)		
Moderate drinker	2,174 (18.0%)	505 (18.7%)	173 (17.7%)	77 (18.2%)	30 (15.6%)		
Mild drinker	3,729 (30.9%)	692 (25.6%)	223 (22.8%)	94 (22.2%)	31 (16.1%)		
Never drinker	1,608 (13.3%)	277 (10.3%)	104 (10.6%)	41 (9.69%)	17 (8.85%)		

Data were presented as unweighted frequencies and proportions. #Test for trend based on the variables containing median values for each quintile.

likely to be male, younger, non-Hispanic White people. Additionally, they were also more likely to have lower income and less married or living together, with higher alcohol drinking levels, cigarette smoking, and a higher occurrence of depression ($p < 0.05$). However, relative to the HIV infection vulnerable populations, the higher BMI, hypertension, and DM were more prevalent among HIV infection low-risk populations ($p < 0.05$). Moreover, no statistically significant difference was observed in the proportions of people who were diagnosed with CVD or CKD, and education level between these two groups.

Similar results were also shown in Supplementary Tables 1–5. Participants were classified into five groups (Mexican American, non-Hispanic White, non-Hispanic Black, other Hispanic, or other people) by HIV risk status and gender to assess the correlation between HIV infection vulnerable populations and depression. Relative to the HIV infection low-risk populations, the HIV infection vulnerable populations were more likely to be younger, less married or living together, with higher alcohol drinking levels and smoking status ($p < 0.05$). Additionally, in non-Hispanic White, non-Hispanic Black and other Hispanic people, the HIV infection vulnerable females have higher occurrence of depression than HIV infection low-risk females ($p < 0.05$).

The association between HIV infection vulnerable populations and depression

To further evaluate the association between HIV infection vulnerable populations and depression. The ORs for depression by HIV risk status were presented in Table 3. According to logistic regression models, the HIV infection vulnerable groups were significantly more likely to suffer depression than control groups with low HIV risk in the pooled sample ($p < 0.01$). After adjusting for age and gender, comparing with those in HIV infection vulnerable participants, those in HIV infection low-risk participants had lower unweighted and weighted odds of depression [OR = 0.55 (0.50–0.62)] and [OR = 0.52 (0.44–0.62)], respectively ($p < 0.01$). In addition, after additionally adjusting for poverty income ratio level, race/ethnicity, BMI, smoking, marital status, and drinking status, relative to the HIV infection vulnerable participants, those in HIV infection low-risk participants also had lower unweighted and weighted odds of depression [OR = 0.69 (0.61–0.79)] and [OR = 0.65 (0.54–0.79), $p < 0.01$]. Moreover, the odds of depression were significantly increased in HIV infection vulnerable group ($p < 0.01$) after further adjusting for the history of CVD, history of hypertension, and history of DM and CKD.

Discussion

This cross-sectional survey researched the association between depression and HIV infection vulnerable populations in United States adults from 1999 until 2018. More than 25% of the participants were reported to be at high risk of HIV infection, and a tenth had depression. Individuals with a high risk of HIV were male, non-Hispanic White people with lower income, less married or living together, a higher occurrence of depression, and higher levels of cigarette smoking and alcohol drinking. In addition, individuals with depression had a higher occurrence of CVD, hypertension, DM and CKD, and occupied a higher proportion of the HIV infection vulnerable populations. Finally, a multivariable logistic regression model demonstrated that depression might be associated with HIV infection vulnerable populations among the United States adults.

Mental health disorders, especially depression, have been extensively documented in PLWH. A systematic review of 41 pieces of literatures selected from PubMed (June 2018) reported that depression is the most common mental health disease in PLWH, next to drug abuse (29). Various factors contribute to the high incidence of depression, including sadness and sorrow, the worry of living with chronic diseases, difficulty obtaining needed social resources (for example, insurance, finances, and transportation), and internalized stigma and discrimination (1, 12, 29, 30). In addition, PLWH have a high incidence of psychosocial risk for depression caused by early childhood trauma, sexual abuse, unsupportive communities, familial attitudes, exposure to violence, poverty, limited healthcare access, less education, and unemployment (31). Behaviors, which increase the risk of HIV infection and spread include drug and alcohol abuse and adverse mental health conditions (32). HIV-linked clinical causes, such as poor antiretroviral adherence and risky sexual behaviors, are associated with depression (7).

Men who had sex with men continue to be at a very high risk of HIV transmission. In 2018, about 1 million people in the United States were diagnosed HIV infections, with MSM accounting for around 69% of all PLWH (33). Common features of this populations include various forms of stigma (33), unprotected anal intercourse, young age, depression, other mental disorders, substance abuse, and condomless

TABLE 2 Characteristics of participants by HIV risk status in the National Health and Nutrition Examination Survey (NHANES), 1999–2018.

Characteristics	HIV high risk	HIV low risk	*p* value	*N*
	N=4,277	*N=12,307*		
Age, years, mean (SD)	35.1 (12.1)	39.0 (11.7)	<0.001	16,584
Gender, *N* (%)			<0.001	16,584
Female	2,301 (53.8%)	7,405 (60.2%)		
Male	1,976 (46.2%)	4,902 (39.8%)		
Family income-to-poverty ratio, *N* (%)			<0.001	15,447
<130%	1,518 (38.0%)	3,606 (31.5%)		
>350%	1,072 (26.9%)	3,791 (33.1%)		
130 to <350%	1,402 (35.1%)	4,058 (35.4%)		
Race and ethnicity, *N* (%)			<0.001	16,584
Non-Hispanic white	1,673 (39.1%)	4,999 (40.6%)		
Non-Hispanic black	1,291 (30.2%)	2,339 (19.0%)		
Mexican American	556 (13.0%)	2,250 (18.3%)		
Other Hispanic	387 (9.05%)	1,286 (10.4%)		
Other	370 (8.65%)	1,433 (11.6%)		
Marital status, *N* (%)			<0.001	15,752
Married/living together	1,445 (36.8%)	8,173 (69.1%)		
Never married	1,622 (41.3%)	2,070 (17.5%)		
Widowed/divorced/separated	862 (21.9%)	1,580 (13.4%)		
Education, *N* (%)			0.319	16,584
High school or less	1,886 (44.1%)	5,317 (43.2%)		
More than high school	2,391 (55.9%)	6,990 (56.8%)		
BMI, kg/m^2, mean (SD)	28.6 (7.34)	29.3 (7.31)	<0.001	16,475
Cerebrovascular disease status, *N* (%)			0.056	15,760
No	3,744 (95.2%)	11,352 (96.0%)		
Yes	187 (4.76%)	477 (4.03%)		
Hypertension status, *N* (%)			0.012	16,584
No	3,205 (74.9%)	8,977 (72.9%)		
Yes	1,072 (25.1%)	3,330 (27.1%)		
Diabetes mellitus status, *N* (%)			<0.001	16,034
Diabetes mellitus	328 (7.87%)	1,343 (11.3%)		
Impaired fasting glucose	118 (2.83%)	399 (3.36%)		
Impaired glucose tolerance	105 (2.52%)	457 (3.85%)		
No	3,618 (86.8%)	9,666 (81.5%)		
Chronic kidney diseases status, *N* (%)			0.466	15,820
No	3,698 (91.1%)	10,668 (90.7%)		
Yes	361 (8.89%)	1,093 (9.29%)		
Depression status, *N* (%)			<0.001	16,584
No	3,720 (87.0%)	11,255 (91.5%)		
Yes	557 (13.0%)	1,052 (8.55%)		
Smoking status, *N* (%)			<0.001	16,137
No	2,634 (64.8%)	9,587 (79.4%)		
Yes	1,433 (35.2%)	2,483 (20.6%)		
Alcohol drinking status, *N* (%)			<0.001	16,362

(Continued)

TABLE 2 (Continued)

Characteristics	HIV high risk	HIV low risk	*p* value	*N*
	N=4,277	*N=12,307*		
Former drinker	408 (9.78%)	1,719 (14.1%)		
Heavy drinker	1,636 (39.2%)	2,824 (23.2%)		
Moderate drinker	819 (19.6%)	2,140 (17.6%)		
Mild drinker	1,034 (24.8%)	3,735 (30.6%)		
Never drinker	276 (6.61%)	1,771 (14.5%)		

Data were presented as unweighted frequencies and proportions.

TABLE 3 Association between depression and HIV risk status in the National Health and Nutrition Examination Survey (NHANES), 1999–2018.

Characteristics	Unweighted		Weighted	
	OR (95% CI)	*p* value	OR (95% CI)	*p* value
Model 1[a]				
HIV high risk	1[Reference]		1[Reference]	
HIV low risk	0.55 (0.50–0.62)	<0.001	0.52 (0.44–0.62)	<0.001
Model 2[a,b]				
HIV high risk	1[Reference]		1[Reference]	
HIV low risk	0.69 (0.61–0.79)	<0.001	0.65 (0.54–0.79)	<0.001
Model 3[a,b,c]				
HIV high risk	1[Reference]		1[Reference]	
HIV low risk	0.69 (0.60–0.79)	<0.001	0.64 (0.52–0.78)	<0.001

OR, odds ratio; CI, confidence interval.

[a] Multivariable-adjusted models were adjusted for age and gender.

[b] Multivariable-adjusted models were additionally adjusted for poverty income ratio level, race/ethnicity, body mass index, smoking, marital status, and drinking status.

[c] Multivariable-adjusted models were further adjusted for cerebrovascular disease, hypertension, diabetes mellitus, and chronic kidney disease.

sex factors, those factors have increased the risk of HIV transmission in United States (1, 27, 34). In the cross-sectional analyses on 11,024 participants in the United States found that males were at a higher risk of HIV infection than females, as well as those with a higher educational status compared to those who had a lower educational status. Furthermore, those with a higher income status were at a lower risk of HIV infection compared to those who had a lower income status (2). Similar trends were observed in our study. This analysis confirmed that HIV infection vulnerable populations were male, younger, had lower income, higher levels of cigarette smoking and alcohol drinking, and a higher prevalence of depression than HIV infection low-risk populations. Therefore, this study's findings suggested that interventions to address adverse mental health conditions and promote healthy lifestyles might prevent subsequent HIV high-risk behaviors.

In this study, we also observed that severe depression and moderately severe depression occupied a higher proportion of the HIV infection vulnerable populations. This aligns with previous research conducted on sexually active male sex workers in the United States, which reported that 74% of male sex workers experienced depressive symptoms and were at a higher risk of engaging in HIV sexual risk behaviors with male clients (19). Similar trends were also found in a cross-sectional epidemiologic study on 300 MSM from the Tanzania observed that depression rates were significantly higher among HIV seropositive MSM compared to HIV seronegative MSM (PR = 1.84, CI = 1.36–2.48), which also found that depression was associated with abuse, HIV, and the risk of HIV transmission (16). Additionally, a previous analysis in the United States, which observed that Hispanic and non-Hispanic Black people had a higher risk of HIV infection than non-Hispanic White people (2). However, our study found that the HIV infection vulnerable populations were more likely to be non-Hispanic White people. These findings might be connected with discrepancies in healthcare access, a higher incidence of other STDs, and partnerships are associated with HIV risk behaviors (35, 36). Another study reported that depression and other adverse mental conditions are more common among White people because drug abuse is more prevalent among White people than Black people (37).

The exact mechanism of causal association between depressive symptoms and HIV infection vulnerable populations remains unclear. However, there are some probable hypotheses. Firstly, depression has been reported to be related to unhealthy behaviors, including smoking, drinking alcohol, condomless sex, substance use, poor nutrition, and lack of physical activity, those factors may contribute to a higher risk of HIV infection. Secondly, the common risk factors of the two populations were lower income, less education, less married, unemployment, and difficulty in getting the needed social resources (for example, insurance, finances, and transportation) (36, 38–41). Thirdly, people with depression may lack the knowledge, social networks, interpersonal skills, impulse control, and inhibitions that may reduce HIV high-risk behaviors (20). Regardless, people with depression should be identified as HIV infection vulnerable populations in prevention arrangement and targeted for HIV prevention efforts (2). Further studies are needed to better understand the complicated associations between depression and HIV infection vulnerable populations.

Strengths and limitations of this research

Major strengths of this research are based on a large sample size of a well-founded nationwide troop in the United States. This large sample size allowed us to perform joint and stratified analyses with adequate statistical power. Additionally, our study built overall HIV risk status and depressive symptoms measure scores to comprehensively assess the complex relationships between depression and the HIV infection vulnerable populations. Moreover, a series of covariate analyses were constructed in this study to present our finding that depression might be associated with HIV infection vulnerable populations.

This study also had some limitations. Firstly, data on depressive symptoms and HIV risk behaviors were mostly self-reported. Secondly, lifestyle varies during adulthood, but this study could not obtain long-term HIV risk status routes. Thirdly, selection bias might have occurred because of those excluded from analyses due to lost data for HIV risk behaviors and PHQ-9. Lastly, the causal relationship between depression and HIV infection vulnerable populations could not be determined owing to the cross-sectional nature of the observational research.

Conclusion

Based on a large nationwide United States cohort, depression might be associated with HIV infection vulnerable populations in the United States adults. More research is needed to evaluate the association between HIV infection vulnerable populations and depression, as well as their causal associations. In addition, the prevention efforts focusing on HIV disclosure and HIV infection vulnerable populations in the United States must address common co-prevalent depression to reduce the rate of new HIV infections.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding authors.

Ethics statement

Ethical approval for this research was considered free because it adopted openly obtainable second-hand data.

Author contributions

ZX and BL: conceptualization, methodology, data analysis, formal management, and visualization. YX and YH: drafting of the manuscript. JP and RT: writing, review, and editing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1146318/full#supplementary-material

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HIV-related stress predicts depression over five years among people living with HIV

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Introduction: Extant literature has demonstrated significant associations between HIV-related stress, social support, and depression among PLWH. However, little research has been conducted on the changes in such associations over time. Our study aims to explore the longitudinal relationship between HIV-related stress, social support, and depression among PLWH over five years.

Methods: 320 PLWH were recruited from Changsha Center for Disease Control and Prevention (CDC), Hunan Province, China. They were assessed for depressive symptoms, HIV-related stress, and social support within 1 month of HIV diagnosis, 1 year after diagnosis, and five years after diagnosis, respectively. Relationships between these variables were examined using a fixed effect model.

Result: The prevalence of depressive symptoms within the first month, first year, and fifth years of HIV diagnosis was 35, 12.2, and 14.7%, respectively. Emotional stress (β: 0.730, 95% CI: 0.648, 0.811), social stress (β: 0.066, 95% CI: 0.010, 0.123), instrumental stress (β: 0.133, 95% CI:0.046, 0.221) positively predicted depression, while social support utilization (β: −0.176, 95% CI: −0.303, −0.049) negatively predicted depression.

Conclusion: Our study suggests that HIV-related stress and social support predict depressive symptoms over time among PLWH and that reducing HIV-related stress and improving social support in the early stages of diagnosis is extremely important in preventing depressive symptoms among PLWH.

KEYWORDS

cohort studies, depression, PLWH, HIV-related stress, social support

1. Introduction

HIV infection is a major global health burden, with 38.4 million people infected and 650 thousand people dying of AIDS-related illnesses in 2021 (1). People Living with HIV (PLWH) are faced with multiple challenges including social stigma, social isolation, and worry about the future, which predisposes them to an increased risk of mental disorder (2). Depression is the most common mental disorder among PLWH, with a meta-analysis showing the prevalence of depression in PLWH was two times higher than in the general population (3). Another meta-analysis reported that the pooled prevalence of depression was 39% among PLWH, with a range of 12.8–78% by various studies in various countries (4). A meta-analysis by Wang et al. showed that the pooled prevalence of depression or depressive symptoms among PLWH in China was 50.8% (5). Depression is characterized by a wide range of symptoms that affect an individual's daily life, including low mood, persistent sadness, poor concentration, pessimistic thoughts, social withdrawal, and loss of interest in the things people usually enjoy (6). It is one of the leading causes of morbidity and mortality among PLWH (7) and is associated with decreased immunity function, severe disease progression, poorer treatment adherence, lower quality of life, and shorter life expectancy (8).

In light of the high prevalence of depression and its significant negative health outcomes among PLWH, it is crucial to identify influencing factors of depression to guide further interventions. Among the various factors that affect depression among PLWH, HIV-related stress is one of the most well-established ones. Being infected with HIV is an extremely stressful experience that may affect every aspect of life (9, 10). Concerns about AIDS-related clinical symptoms, drug side effects, AIDS-related social stigma, and uncertainty about disease outcomes all bring enormous stress to PLWH (10–12). Studies have shown PLWH under great stress were at an increased risk of health-damaging behaviors such as smoking (13), alcohol consumption (14), and unsafe sex (15), which may lead to depression. A higher level of HIV-related stress has been shown to be associated with a higher prevalence of depression in PLWH (16), which may be explained by the disturbances in 5-hydroxytryptamine and stress hormones caused by persistent stress (17).

Social support is another well-established factor that affects depression among PLWH. A recent meta-analysis showed that PLWHs with poor social support were over two times more likely to develop depression than those with strong social support (18). Adequate social support is helpful to relieve HIV-related stress, improve physical and mental health, and reduce the prevalence of depression (16). In addition, previous studies in our research group have shown that adequate social support can reduce HIV-related stress levels in PLWH (19). Two general models have been proposed to elucidate the beneficial role of social support on depression: the direct effect model and the stress buffer model. In the direct effect model, social support has a direct positive effect on preventing depression (20). In the stress buffer model, social support can mitigate the negative effects of negative events on depression (21). A large body of evidence has demonstrated that social support decreases the level of depression among PLWH either directly, or indirectly through its buffering effect (21, 22). The relationship among HIV-related stress, social support, and depression among PLWH may be explained by the conceptual framework of stress, social support, and health behavior to understand the multiple determinants of health status, in this case, depression or depressive symptoms (23, 24). According to this model, PLWH's depression is affected by HIV-related stress and several protective factors (e.g., social support) have both direct and indirect moderating effects on depression.

Although abundant evidence has shown the positive association between HIV-related stress and depression as well as the negative association between social support and depression, such associations are mainly based on cross-sectional investigations. Longitudinal studies allow the exploration of time effects and patterns of relationships over time. To the best of our knowledge, however, little research has been conducted on how HIV-related stress and social support influence depression over time. Therefore, our study aims to explore the longitudinal relationship between HIV-related stress, social support, and depression among PLWH over five years.

2. Methods

2.1. Study design and participants

Based on the support and cooperation of Changsha CDC professionals, the five-year longitudinal observational study was conducted at the Changsha Center for Disease Control and Prevention (CDC), Hunan Province, China. Changsha City, located in the south-central region of China, is the capital city of Hunan Province, China. A previous study reported a total of 3,624 cases of PLWH in Changsha City between 2011 and 2016, including 3,145 males and 479 females (25). We conducted the baseline survey from March 2013 to September 2014, the first (one-year) follow-up survey from March 2014 to October 2015, and the second (five-year) follow-up survey from March 2018 to April 2019. To be eligible for participation individuals had to be 18 years or older, receiving an HIV diagnosis ≤1 month, and living in Changsha for at least 6 months. The reason we included newly diagnosed PLWH only was to better examine the effect of time effects on depression since the impact of HIV infection diagnosis may change over time and the risk of depression among PLWH may be different at different time points of HIV infection diagnosis. Participants were excluded if they were unable to understand the study procedures due to illiteracy, intoxication, or cognitive difficulties observed by an interviewer.

All study procedures were approved by the Ethics Committee of Central South University. Before the formal investigation, the investigators explained in detail the study's purpose, content, and significance to participants. Participants were also informed that their personal information would be kept confidential. After providing written informed consent, participants were invited to complete the questionnaires through face-to-face or telephone interviews.

During the baseline survey, 1,267 PLWH were newly diagnosed in Changsha CDC, of whom 855 met the inclusion criteria, and 557 eventually participated in the baseline survey. Among the 557 participants who completed the baseline survey, 410 completed the first follow-up survey, and 386 completed the second follow-up survey. Finally, 320 participants completed all three surveys. Figure 1 shows a detailed flow chart of participant recruitment.

2.2. Measures

2.2.1. Background information

Social demographic information was collected through a self-administered background questionnaire, which included gender, age, residence, sexual orientation, marital status, education level, and work status. After the study team signed the information confidentiality agreement and obtained the permission of the local CDC, participants' HIV-related clinical information (CD4 count and whether they were receiving antiretroviral therapy) was

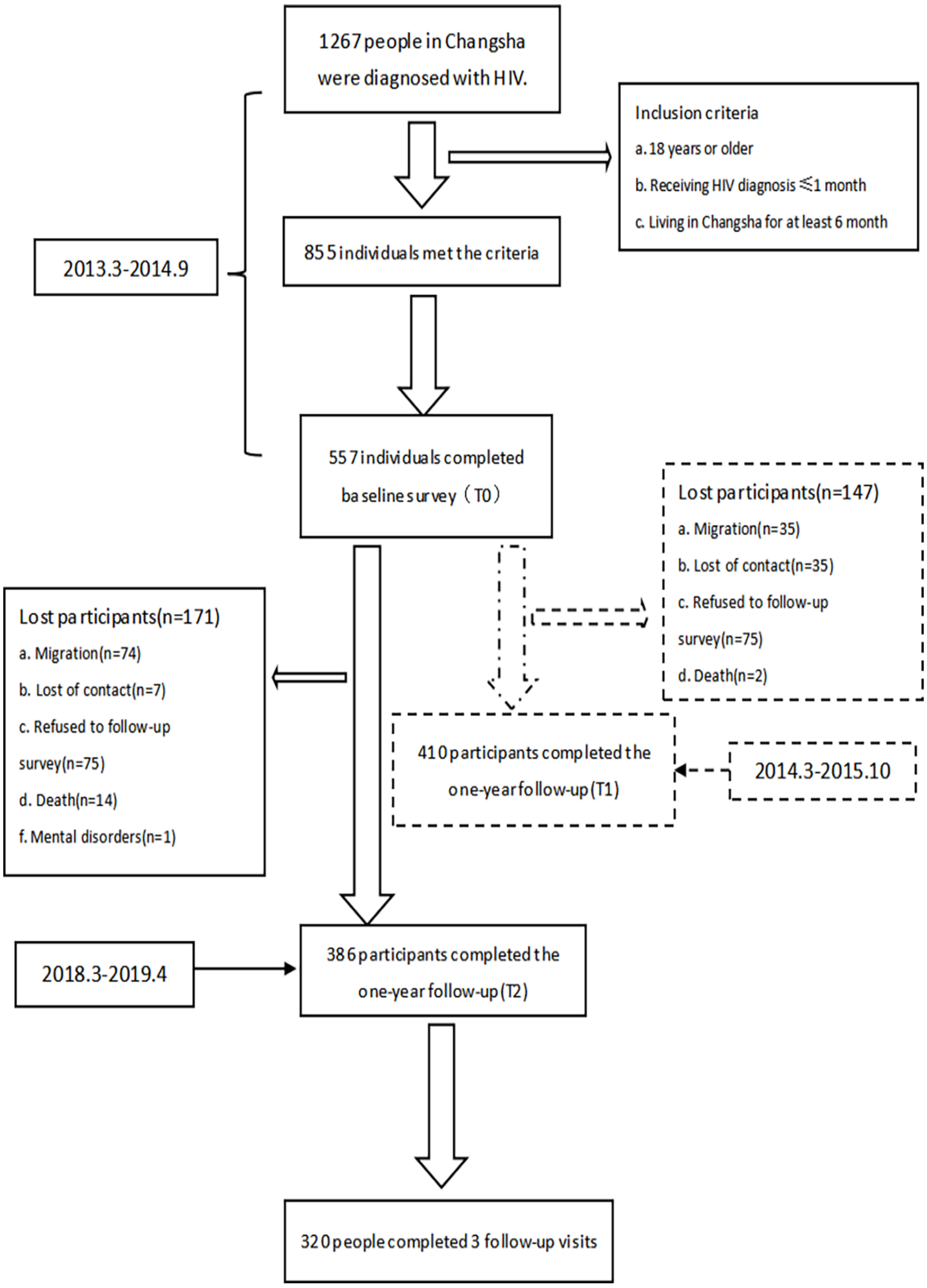

FIGURE 1
Flowchart of participant enrollment.

obtained through the Chinese HIV/AIDS Comprehensive Response Information Management System (CRIMS), which run by CDC.

2.2.2. Depression

The 9-item Patient Health Questionnaire (PHQ-9) was used to assess depressive symptoms in study subjects over the past 2 weeks. Each item is scored on a four-point Likert scale from 0 (not at all) to 3 (nearly every day). The total score ranges from 0–27, with higher scores indicating more depressive symptom (26). The PHQ-9 showed good internal consistency in our baseline survey, with a Cronbach's α coefficient of 0.914.

2.2.3. Social support

The 10-item Social Support Rating Scale (SSRS) was used to assess perceived social support from three domains: objective support (3 items), subjective support (4 items), and support utilization (3 items) (27). Subjective support reflects the patient's subjective emotional experience and satisfaction of being respected, supported, or understood. Objective support reflects the support the patient believes he or she receives, including both direct assistance and social associations. Social support utilization reflects the extent to which the patient makes use of social support. The total score ranges from 12–66, with higher scores indicating higher levels of social support. The SSRS showed good internal consistency in our baseline survey, with a Cronbach's α coefficient of 0.805.

2.2.4. HIV-related stress

HIV-related stress was assessed by the 17-item Chinese HIV/AIDS Stress Scale (CSS-HIV), which is an AIDS-specific stress scale and assesses stress levels from three dimensions: emotional stress (7 items), social stress (10 items), and instrumental stress (6 items) (28). Emotional stress includes HIV/AIDS-related grief/bereavement, distressing emotions, and concerns about death. Social stress includes stressful social events such as isolation, stigma, difficulties in disclosure of HIV status, and interpersonal associations. Instrumental stress includes daily practical difficulties associated with HIV/AIDS-related financial, transport, and treatment problems. Each item is rated on a 5-point Likert scale from 0 (not at all) to 4 (extremely). The total score ranges from 0–68, with higher scores indicating higher levels of HIV-related stress. The CSS-HIV showed good internal consistency in our baseline survey, with a Cronbach's α coefficient of 0.903.

2.3. Statistical analysis

To compare whether there were differences in baseline characteristics between those who completed three follow-up visits and those who did not, chi-square tests were used for categorical variables, and two independent samples t-tests were used for quantitative data. ANOVA was used to compare the scores of social support, HIV-related stress, and CD4 counts at the three time points. Chi-square tests were used to compare the prevalence of depression and treatment rate at the three time points. Finally, the correlation between HIV-related stress, social support, and depression, as well as the interaction between HIV-related stress, social support, and time were analyzed separately by a mixed-effects model. A mixed effects model is a statistical test used to predict a single variable using two or more other variables and is most widely used in a longitudinal study where individuals are followed over a period of time and data are collected at multiple time points (29). A mixed effects model uses both fixed and random effects to reflect a hierarchy of levels with repeated, correlated measurements among all levels (29). The fixed effects show the population mean differences between any set of treatments while the random effects represent the general variability among subjects or units (29).

3. Results

3.1. Characteristics of participants

Table 1 shows the baseline characteristics of the participants. Among the 320 participants who completed all three visits, slightly over half were of urban residence (50.9%), aged$\geq$30 (53.7%), single (58.4%), and with high school and below education (54.2%). Most were males (90.9%) and non-heterosexual (61.87%). 112 participants screened positive for depression (35%). The mean values of HIV-related stress, social support, and CD4 count were 22.61, 28.91, and 367.13, respectively.

A comparison of the sample characteristics between those who completed all three visits and those who did not (lost to follow-up) showed no significant differences in all characteristics except for gender and marital status. Compared to those who completed all three surveys, those who were lost to follow-up were more likely to be males (94.5% vs. 90.9, $p = 0.004$) and single (67.5% vs. 58.4%, $p = 0.011$).

TABLE 1 Baseline characteristics of the participants who completed all three visits and those who did not.

Characteristics	Completed all three visits (*n* =320) *n* (%)	Lost to follow-up (*n* =237) *n* (%)	*p*
Residence			0.943
Rural	157 (49.1)	117 (49.4)	
Urban	163 (50.9)	120 (50.6)	
Age			0.121
<30	172 (53.7)	143 (60.3)	
≥30	148 (46.3)	94 (39.7)	
Sex			0.004
Male	291 (90.9)	224 (94.5)	
Female	29 (9.1)	13(5.5)	
Marital status			0.011
Single	187 (58.4)	160 (67.5)	
Married	95 (29.7)	44 (18.6)	
Divorced/widowed	38 (11.9)	33 (13.9)	
Education			0.537
High school and below	139 (43.4)	122 (51.8)	
College and above	181 (56.6)	115 (48.5)	
Sexual orientation			0.542
Heterosexuality	122 (38.1)	81 (34.2)	
Homosexuality	129 (40.3)	106 (44.7)	
Bisexual	69 (21.6)	50 (21.1)	
Depression			0.941
yes	112 (35.0)	84 (35.4)	
no	208 (65.0)	153 (64.6)	
HIV-related stress, mean (SD)	22.61 (13.28)	22.88 (13.24)	0.812
Social support,mean, (SD)	28.91 (7.80)	29.31 (9.06)	0.567
CD4 count, cells/mm3, mean (SD)	365.92 (187.67)	379.58 (184.45)	0.522

3.2. Changes in psychosocial characteristics during three visits

Table 2, Figures 2–4 show the changes in depression prevalence, HIV-related stress, and social support during the five years. The prevalence of depression was 35% at baseline, declined to 12.2% at the first-year follow-up, and then increased slightly to 14.7% at the fifth-year follow-up, showing significant differences over time ($p < 0.001$). All three dimensions of HIV-related stress showed significant differences in three visits, with a generally declining trend over time (Figure 3). For social support, both subjective and objective support showed significant differences in three visits, with a declining trend

TABLE 2 Changes of psychosocial characteristics.

Characteristics	T0	T1	T2	*p*
Depressive symptoms				<0.001
yes (%)	112 (35)	39 (12.2)	47 (14.7)	
no (%)	208 (65)	281 (87.8)	273 (85.3)	
HIV-related stress				
Emotional stress, mean (SD)	6.72 (5.19)	3.69 (3.85)	3.50 (4.55)	<0.001
Social stress, mean (SD)	11.28 (5.75)	7.80 (5.82)	8.79 (5.50)	<0.001
Instrumental stress, mean (SD)	4.62 (4.24)	3.10 (3.54)	3.09(3.94)	<0.001
Social support				
Subjective support, mean (SD)	14.84 (5.51)	15.35 (6.65)	18.75 (4.70)	<0.001
Objective support, mean (SD)	7.92 (9.91)	6.56 (2.79)	5.87 (2.71)	<0.001
Support utilization, mean (SD)	6.15 (1.75)	6.09 (1.91)	6.34 (2.44)	0.154

The prevalence of depressive symptom is tested using chi-square tests, and other variables were analyzed using ANOVA. $p < 0.05$ indicated significant differences between variables at different time points.

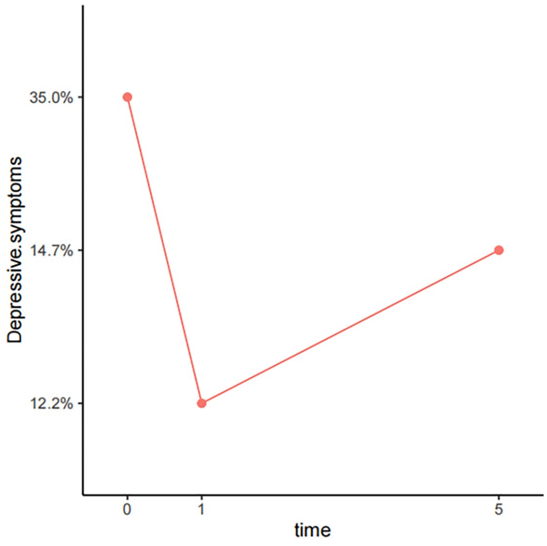

FIGURE 2
Five-year trajectory chart of depressive symptoms.

over time. However, support utilization showed no significant difference during the three visits (Figure 4).

3.3. The association between social support, HIV-related stress, and depression

Table 3 shows the association between social support, HIV-related stress, and depression using a mixed-effects model. We chose a linear model as the linking function to analyze the fixed effects of all variables. In model 1, after adjusting for sample characteristics, HIV-related stress showed a significant positive association with depression (β: 0.306, 95% CI: 0.284, 0.327). In model 5, after adjusting for sample characteristics, social support showed a significant negative association with depression (β: -0.158, 95% CI: −0.201, −0.115). There was no significant interaction between HIV-related stress and social support.

Table 4 shows the association between three dimensions of social support, three dimensions of HIV-related stress, and depression using a mixed-effects model. We chose a linear model as the linking function to analyze the fixed effects of all variables. In model 4, after adjusting for sample characteristics, all three dimensions of HIV-related stress showed significant positive associations with depression, with β ranging from 0.067 to 0.751 (95% CI: 0.011, 0.832). In model 5, after adjusting for sample characteristics, all three dimensions of social support showed significant negative associations with depression, with β ranging from −0.086 to −0.461 (95% CI: −0.641, −0.017). In model 6, after adjusting for sample characteristics and adding social support, the positive effects of emotional stress, social stress, and instrumental stress on PLWH depression were still significant (β: 0.066–0.730, 95% CI:0.010, 0.811), while only support utilization showed a significant negative association with depression (β: -0.176, 95% CI: −0.303, −0.049).

Table 5 shows the interaction between HIV-related stress, social support, and time. We chose a linear model as the linking function to analyze the fixed effects of all variables. For HIV-related stress, two dimensions showed significant interactions with time: emotional stress (β: 0.197, 95% CI:0.173,0.221) and instrumental stress (β: 0.028, 95%CI:0.002,0.054). For social support, only the subjective support (β: -0.042, 95% CI: −0.065, −0.019) and social support utilization (β: -0.135, 95% CI: −0.183, −0.088) showed significant interaction with time.

In addition, we further run an interaction analysis between support utilization and the three dimensions of stress. Our results showed significant interactions between support utilization and emotional stress (β: 0.128, 95% CI: 0.113,0.143), as well as between support utilization and instrumental stress (β: 0.024, 95% CI: 0.008, 0.040) (Supplementary Table S1).

4. Discussion

Based on a longitudinal study design, our study describes the five-year trajectory of depression, HIV-related stress, and social support among PLWH and explores their associations over time. Our major findings were that both depression and HIV-related stress showed a significant decrease over time, while social support showed a significant increase over time. All three dimensions of HIV-related stress and the support utilization dimension of social support predicted depression over time. Our findings add to the current literature and provide important implications for future interventions to provide more efficient social support and stress management services to PLWH at different stages of their diagnosis.

Our study showed a significant decrease in depression prevalence among PLWH over time, from 35% 1 month after diagnosis to 12.2% 1 year after diagnosis, and 14.7% five years after diagnosis. Over time, the relief of depressive symptoms among newly-diagnosed PLWH

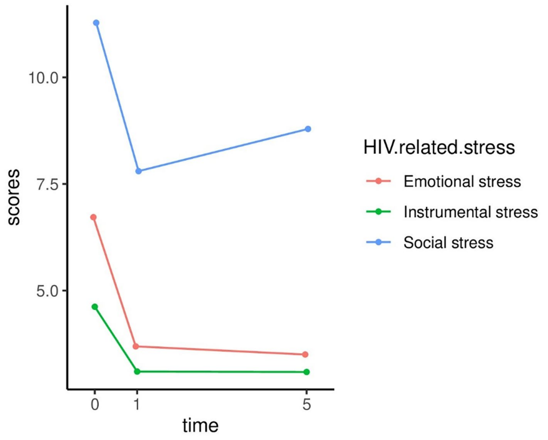

FIGURE 3
Five-year trajectory chart of HIV-related stress.

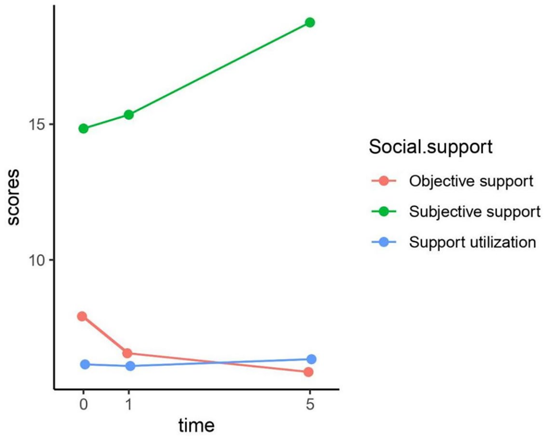

FIGURE 4
Five-year trajectory chart of social support.

may reflect the positive transformation during their struggle with the traumatic event of HIV diagnosis, which has been referred to as post-traumatic growth (PTG) (30–32). There is growing empirical evidence showing that PTG exists among PLWH and helps promote positive mental health growth (30–32). With PTG, PLWH were able to gradually accept their HIV infection over time and were able to cope positively, including actively learning about HIV and seeking help from professional institutions (30–32). This finding suggests that identification and improvement of PTG among PLWH may help foster positive transformation and prevent the occurrence of depression. Furthermore, the significant changes in depression prevalence over time also suggest the assessment and reporting of depression should consider the diagnosis time. However, most of the previous studies did not differentiate the timing of HIV diagnosis when reporting the prevalence of depression (33–36), which may explain the large discrepancy observed in various studies. Our longitudinal study design makes it possible to observe the dynamic changes of depression among PLWH at different stages of the disease and is thus recommended for future research.

Our study showed that HIV-related stress including emotional stress, social stress, and instrumental stress all predicted depression over five years, even after controlling for socio-demographic and clinical characteristics as well as social support. The findings were consistent with previous literature showing HIV-related stressors as a major contributor to depression development among PLWH (37, 38). Our study also showed that emotional stress, social stress, and instrumental stress were highest in PLWH at baseline, presenting a consistent downward trend over the five years. This pattern was consistent with the changes in depression prevalence over the same period, further corroborating the positive associations between HIV-related stress and depression. This finding suggests that prevention of depression among PLWH may benefit from alleviating their HIV-related stress, especially at the initial diagnosis stage when their stress levels were the highest. In addition, the positive interactions between emotional stress, instrumental stress, and time suggest that the effects of emotional and instrumental stress on depression increased over time. This finding indicates the need to start intervention to relieve HIV-related stress as early as possible to reduce its long-lasting negative effects on the later development of depression.

The result indicated that social support including subjective support, objective support, and social support utilization all negatively predicted depression after adjusting for socio-demographic and clinical characteristics. Social support is usually defined as a person's material or emotional support from others (39). Our finding was consistent with the wide literature showing the protective role of social support in promoting mental health and preventing depression among PLWH (18, 38, 40, 41). However, after further adjusting for the three dimensions of HIV-related stress, only social support utilization showed a significant negative association with depression. Social support utilization represents the degree to which individuals proactively seek help and resources to help them deal with challenges and difficulties (42). Our finding suggests that the actual utilization of social support, rather than the availability of social support plays an essential role in improving mental health and preventing depression among PLWH. This has implications for future depression prevention programs to focus not only on the provision of social support but also the encouragement of PLWH to actively utilize support to achieve the best health-promoting benefits. Furthermore, the negative interactions between subjective support, social support utilization, and time suggest that the effects of subjective support and social support utilization on depression diminish over time. Therefore, providing subjective support and promoting support utilization in the early stage of HIV diagnosis may achieve maximal benefits in depression prevention.

In general, the finding that HIV-related stress and social support predicted depressive symptoms among PLWH supports the application of the conceptual framework of stress, social support, and health behavior among PLWH. This model furthers our understanding of the multiple determinants of PLWH's depression and highlights the complicated interactions among the multiple determinants. PLWH's depression is a dynamic process over time and is affected by multiple factors. Our findings provide important insights for future research to investigate the mental health of PLWH under a broader and multilevel background and develop comprehensive intervention programs that involve different components such as a combination of stress reduction and social support enhancement.

TABLE 3 Association between HIV-related stress, social support with depression.

Characteristics	Model 1β (95%CI)	*p*	Model 2β (95%CI)	*p*	Model 3β (95%CI)	*p*
Time						
T0	1.688 (0.957，2.420)	<0.001	3.557 (2.614，4.500)	<0.001	1.656 (0.928，2.383)	<0.001
T1	0.612 (0.003，1.222)	0.0049	−0.133 (−0.949，−0.684)	0.750	0.449 (−0.164，1.062)	0.151
T2						
HIV-related stress	0.306 (0.284，0.327)	<0.001			0.308 (0.237，0.379)	<0.001
Social support			−0.158 (−0.201，−0.115)	<0.001	−0.048 (−0.100，0.004)	0.068
HIV-related stress × Social support					<0.001 (−0.002，0.001)	0.612

Model 1: Number of measurements + HIV-related stress after adjusting for socio-demographic and clinical characteristics; Model 2: Number of measurements + social support after adjusting for socio-demographic and clinical characteristics; Model 3: Number of measurements + HIV-related stress + social support + interaction of HIV-related stress with Social support after adjusting for socio-demographic and clinical characteristics.

TABLE 4 Relationship between the three dimensions of HIV-related stress, the three dimensions of social support, and depression.

Characteristics	Model 4β (95%CI)	*p*	Model 5β (95%CI)	*p*	Model 6β (95%CI)	*p*
Time						
T0	1.241 (0.387，2.095)	0.004	3.587 (2.377，4.796)	<0.001	1.248 (0.371，2.125)	0.005
T1	0.337 (−0.267，0.942)	0.274	0.117 (−0.783，1.016)	0.799	−0.252 (−0.339，0.843)	0.403
T2						
HIV-related stress						
Emotional stress	0.751 (0.671，0.832)	<0.001			0.730 (0.648，0.811)	<0.001
Social stress	0.067 (0.011，0.123)	0.019			0.066 (0.010，0.123)	0.021
Instrumental stress	0.138 (0.050，0.266)	0.002			0.133 (0.046，0.221)	0.003
Social support						
Subjective support			−0.086 (−0.156，−0.017)	0.015	−0.002 (−0.051，0.048)	0.952
Objective support			−0.154 (−0.291，−0.018)	0.026	−0.036 (−0.133，0.061)	0.464
Support utilization			−0.461 (−0.641，−0.281)	<0.001	−0.176 (−0.303，−0.049)	0.007

Model 4: Number of measurements + HIV-related stress after adjusting for socio-demographic and clinical characteristics; Model 5: Number of measurements + social support after adjusting for socio-demographic and clinical characteristics; Model 6: Number of measurements + HIV-related stress + social support after adjusting for socio-demographic and clinical characteristics.

TABLE 5 The interaction of HIV-related stress, social support with time.

Characteristics	Model 7β (95%CI)	*p*	Characteristics	Model 8**β** (95%CI)	*p*
Time			Time		
T0	6.699 (5.839，7.599)	<0.001	T0	−2.717 (−4.620，−0.813)	0.005
T1	2.894 (2.202，3.585)	<0.001	T1	−4.839 (−6.375，−3.303)	<0.001
T2			T2		
Interaction			Interaction		
Time × Emotional stress	0.197 (0.173，0.221)	<0.001	Time × Subjective support	−0.042 (−0.065，−0.019)	<0.001
Time × Social stress	0.008 (−0.009，0.025)	0.378	Time × Objective support	0.001 (−0.042，0.043)	0.976
Time × Instrumental stress	0.028(0.002，0.054)	0.035	Time × Support utilization	−0.135 (−0.183，−0.088)	<0.001

Model 7: Number of measurements + interaction of HIV-related stress with time after adjusting for socio-demographic and clinical characteristics; Model 8: Number of measurements + interaction of social support with time after adjusting for socio-demographic and clinical characteristics.

There are also some limitations to our study. First, the study population came from a convenience sample of PLWH from Changsha CDC and may not represent PLWH from other clinics in other areas of China, extrapolation of the conclusion of this study should be particularly cautious. Second, the assessment of depression was based on a screening tool of PHQ-9 instead of a standard diagnostic tool. Third, our study has not comprehensively investigated all the factors that may influence depression and there may be additional factors that affect the model results such as PTG. Fourth, our study was focused on the impact of psychological factors on depression of PLWH, with much less attention paid to other equally important factors such as socio-demographic factors, which warrants further research. Fifth, there were more female and married participants in those who completed all three follow-ups than in those who did not, which may lead to an underestimation or overestimation of the risk of depressive symptoms among female and married participants. Finally, we investigated inconsistent time intervals during follow-up, which may lead to the loss of some important information, such as the continuous changes in the prevalence of depressive symptoms from the first year to the fifth year of diagnosis.

5. Conclusion

Our findings contribute to a better understanding of the association between HIV-related stress, social support, and depressive symptoms and shed light on the time effect. This study provides valuable theoretical and methodological insights for relevant health service providers. The results of this study suggest that HIV-related stress and social support predict depressive symptoms among PLWH over a five-year period. Our findings suggest that reducing HIV-related stress and improving social support in the early stages of diagnosis is extremely important in preventing and controlling depressive symptoms among PLWH.

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions: The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions. Requests to access these datasets should be directed to DL, luodan_csu_2011@126.com.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee, Xiangya School of Public Health, Central South University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

DL conceived and designed the cohort study, was responsible for study coordination and data management, and assisted in interpretation and manuscript writing. ZL analyzed data and wrote the first version of the manuscript. XC, JL, and ZX assisted in reviewing protocol and study coordination in the field and reviewed the manuscript. JL, ZX, and YH, critically reviewed the manuscript for important intellectual content. ZL, XC, JL, ZX, YH, and DL contributed to the acquisition, analysis, or interpretation of data. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1163604/full#supplementary-material

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Higher rates of mental health screening of adolescents recorded after provider training using simulated patients in a Kenyan HIV clinic: results of a pilot study

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Background: Kenyan adolescent girls and young women (AGYW) experience a dual burden of HIV and common mental disorders (CMD). HIV clinics are a key entry point for AGYW in need of integrated CMD and HIV care; however, rates of screening and referral for CMDs are low. Our objective was to test an evidence-based provider training strategy, simulated patient encounters (SPEs), on CMD service delivery for AGYW in a Kenyan HIV clinic.

Methods: This pilot study was conducted in a public HIV clinic in Thika, Kenya from January to November 2021. The simulated patient encounter (SPE) implementation strategy included case script development from prior qualitative work, patient actor training, and a three-day SPE training including four standardized mock clinical encounters followed by quantitative surveys assessing provider competencies for each encounter. We abstracted medical record data related to HIV and CMDs such as HIV status, reason for visit, CMD screening test performed, and counselling or referral information. We conducted an interrupted time series analysis using abstracted HIV and CMD screening rates from AGYW ages 16–25 years visiting the clinic 7 months before and 3 months after SPE training. We used generalized linear models to assess changes in CMD screening rates after training.

Results: A total of 10 providers participated in the training. Competency ratings improved across four mock encounters (mean score from 8.1 to 13.7) between first and fourth encounters. We abstracted all medical records ($n = 1{,}154$) including from 888 (76%) AGYW seeking HIV treatment, 243 (21%) seeking prevention services, and 34 (3%) seeking other services. CMD screening rates increased immediately following training from 8 to 21% [relative risk (RR) = 2.57, 95% confidence interval (CI) = 1.34–4.90, $p < 0.01$]. The 3 months following the SPE training resulted in an 11% relative increase in CMD screening proportion compared to the 7 months pre-SPE (RR: 1.11, 95% CI: 1.04–1.17, $p < 0.01$). Finally, 1% of all pre-SPE screens resulted in referral versus 5% of post-SPE screens ($p = 0.07$).

Conclusion: The SPE model is a promising implementation strategy for improving HIV provider competencies and CMD service delivery for adolescents in HIV clinics. Future research is needed to explore effects on adolescent clinical outcomes in larger trials.

KEYWORDS

HIV, global mental health, simulated patient encounters, service integration, implementation strategies, Kenya, adolescents and young adults

1. Introduction

Common mental disorders (CMDs), including depression, anxiety, substance abuse, and post-traumatic stress, are especially prevalent among adolescents and often co-occur with HIV risk and related morbidity and mortality (1). Recent studies conducted in Kenya and other sub-Saharan African countries found a 30%–50% prevalence of CMDs among adolescent girls and young (AGYW) between the ages of 16–25 years who were seeking HIV treatment or prevention services (2–6). CMDs can increase risk for or exacerbate symptoms associated with HIV. For example, poor mental health is associated with reduced adherence to HIV-related medications and an HIV diagnosis can contribute to depression and anxiety (2–4, 7–9). In addition, CMDs and HIV share social and structural determinants of risk (e.g., gender-based violence, food insecurity) that contribute to the dual burden of disease among AGYW (1).

Integrating CMD screening, referrals, and evidence-based treatments with HIV prevention and treatment programs has the potential to address both mental and physical needs of AGYW (1). The World Health Organization (WHO) recommends routine CMD screening at HIV service delivery points to synergistically improve mental health and HIV outcomes in settings with high burden of both conditions including Kenya (6, 10–13). Systematic reviews on HIV and mental health service integration have emphasized that successful care integration requires training HIV providers in CMD symptom identification, basic adolescent-friendly counseling skills, and referral pathways (14, 15). AGYW at HIV clinics in Kenya have expressed the need for integrated mental health and HIV services, but also have concerns about HIV providers' negative attitudes about mental health and a lack of recognition of mental health needs (16). HIV providers themselves have also expressed hesitancy with offering routine CMD screening for HIV clinic patients, citing lack of confidence, competency, and training to provide mental health services (17).

Strategies are needed to enhance HIV provider competencies around mental health service delivery to reduce the mental health treatment gap and improve patient-centered care for AGYW in Kenya (18, 19). Simulated patient encounters (SPE) are an implementation strategy that involve training standardized patient actors (SPs) to work with healthcare providers in mock clinical encounters for training and evaluation (20). This approach has been shown to improve provider skills in clinical assessment, patient-centered communication, and counseling (21). SPE training uses case scripts representing typical service users, provider training didactics, role-plays, competency assessments, and feedback models to improve clinical outcomes. In Kenya, simulated patients have been used to improve PrEP service delivery for AGYW, quality of care for childhood illnesses, quality of sexually transmitted disease case management, and adolescent retention in HIV care (22–26). Within this growing body of evidence, the SPE approach has not yet been tested in Kenya to improve CMD care delivery among AGYW receiving HIV services. The primary objective of this pilot study was to test the effect of an SPE training on mental health service delivery for Kenyan AGYW in HIV clinic settings. We hypothesized that an SPE strategy could improve HIV provider competencies to deliver mental health screening and referral for AGYW in a Kenyan HIV clinic, which could in turn improve mental health and HIV prevention and treatment outcomes among AGYW (27).

2. Materials and methods

2.1. Study design and participation

This work was conducted in three phases: (1) qualitative research to inform SPE strategy development; (2) SPE training and provider competency assessments; and (3) an interrupted time series analysis assessing the effect of the SPE training on CMD screening rates among AGYW attending a Kenyan HIV clinic. This study was conducted with providers (phases 1 and 2) and patients (phases 1 and 3) in Thika, Kenya at Thika sub-County Hospital, a public facility providing HIV prevention [HIV testing, pre-exposure prophylaxis (PrEP)] and treatment [antiretroviral therapy (ART)] services to Kenyan AGYW. The study took place from January 2021 to November 2021.

2.2. Phase 1: intervention development

2.2.1. Qualitative data collection and analysis

We conducted a qualitative exploratory study among AGYW and HIV and mental health providers which informed the development of four standardized patient case scripts and provider competency checklists for the SPE training (28). Qualitative data from this phase were analyzed only for the purpose of developing case scripts. The methods and results from this phase have been previously described (28).

2.3. Phase 2: SPE training

Six professional Kenyan actors with previous experience conducting role plays for HIV outreach events were trained to portray simulated patients as depicted in our case scripts. The case scripts represented AGYW seeking HIV services and presenting a range of symptoms of CMDs (Supplementary File 1). All actors were young women, ages 18–25, and were trained in the standardized patient methodology over 3 days on Zoom by an expert trainer. The actor training curriculum followed the Association of Standardized Patient Educators (ASPE) Standards of Best Practice (29). Also because the training was virtual, the training curriculum incorporated aspects of a multimodal model for online education which integrates relevant theoretical frameworks for online education (30). The model emphasizes the concept of learning communities which enhanced the actor's knowledge acquisition, active engagement, and overall experience. The training curriculum included the three areas: (1) fundamentals of simulated patient methodology, (2) case portrayal, and (3) delivering constructive feedback. The first section was a didactic lecture to educate actors on the fundamentals of being an authentic realistic patient for the provider training. The next area focused on training actors on how to assume the character embedded in the case scripts. One actor was assigned to each case script for the provider training. Each case script had secondary actors trained to perform the case if needed (e.g., due to an unexpected illness or absence among another actor). The third training area was on delivering case specific constructive verbal feedback to the providers. The feedback training emphasized specific points; each actor should focus on based on their case script. Since there were multiple actors portraying the same case script and delivering subsequent feedback, it was important to establish consistency, standardization, and accuracy of the portrayal and feedback delivery. Inter-performance reliability and consistency was established with actor active engagement in role-plays, paired practice, and small group discussions. These activities allowed the actors to practice and receive feedback on their case portrayal and feedback delivery. Actors had the opportunity to be the performer and receive individual feedback as well as learn through the observation of their peers performing. The actors were encouraged to ask questions and self-reflect on how to improve. At the end of the training workshop, all actors participated in a "dry run" assessment to confirm their readiness to participate in the provider training. The trainer and the study team rated each actor using an evaluation form. The evaluation form consisted of six questions with a nominal yes/no scale for each question. The questions assessed the actor's readiness to proceed to the provider training. Actors had to receive all yes scores from both the trainer and study team member to move forward. Any actor who did not fall into this category were considered for re-training or dismissal from the study.

We then conducted an in-person three-day SPE training with 10 providers at the Thika sub-County Hospital. Eligible providers included those who were currently a doctor, clinical provider, or nurse providing HIV prevention or treatment services to AGYW (such as routine HIV testing, and PrEP delivery for HIV prevention, or ART delivery for HIV treatment). All eligible providers were invited to participate in the SPE training. SPE training materials were developed based on qualitative findings, relevant literature on CMD screening, counseling, and treatment, and Kenyan Ministry of Health guidelines on mental health and HIV service provision. Day 1 included didactic content on CMD symptom presentation, screening tools, and active referral techniques. We discussed adolescent-friendly communication skills (e.g., protecting confidentiality, non-judgmental and warm tone). Didactic content on screening tools was limited to existing tools available at the clinic; no new CMD screening tools were introduced to the trainees. Staff were trained in English versions of tools. Days 2–3 of the training included mock clinic encounters with the standardized patient actors. Each provider completed four mock encounters with the SPs to be exposed to each of the four case types. After each encounter, actors provided verbal feedback directly to the provider, describing how they felt during the encounter, things the provider did well, and areas for improvement related to adolescent-friendly communication and elicitation of CMD symptoms. All patient encounters were video recorded for training purposes.

2.3.1. Provider competence measures

After each encounter, the patient actors, other healthcare providers, and research team members evaluated each provider's skills in adolescent-friendly communication, assessment, and screening for CMDs, and any provision of referral services or basic counseling to triage the patient as needed. Evaluations were conducted using standardized competency checklists (Supplementary File 2; total possible score was between 0–15) with the following domains: assessed CMD symptoms via screening (possible score: 0–3); assessed next clinical care steps based on screening results (possible score: 0–3); made appropriate referral(s) as needed (possible score: 0–3); displayed active listening skills (possible score: 0–3); and asked clarifying questions (possible score: 0–3). Score level 0 reflected that the domain was not done, level 1 that it was completed vaguely or poorly, level 2 that it was partially completed, and level 3 that it was completed fully. Competency scales were developed based on the literature and goals of our case scripts and SPE training materials. The study team discussed the scales to establish content validity. Scales were also reviewed by the team and the patient actors during their training to discuss and troubleshoot potential quality control issues with their completion.

Healthcare providers completed surveys before and after the SPE training to assess knowledge and self-rated competency in mental health service delivery (screening, participant triage as needed, providing referrals accurately and with warm handoffs). Surveys included a 12-item knowledge questionnaire with Likert responses to questions like, "People with depression or anxiety could snap out of it if they wanted." The scales were developed from prior work with women in Kenya (31). Items were scored from 0–4 and summed (possible range: 0–48), with a higher total score indicating greater knowledge around CMDs. Providers also completed an 11-item questionnaire related to their self-rated competencies for mental health service delivery with Likert responses to questions such as, "I feel confident in my ability to screen AGYW for common mental disorders like depression, anxiety, and stress." Items were also scored from 0–4 and summed (possible range: 0–44), with a higher score indicating greater self-rated competency for delivering mental health services to AGYW in HIV care settings.

We used descriptive statistics to explore self-rated provider knowledge and competencies before and after the training. We also assessed average provider competency ratings across the four clinic encounters to quantify any improvement in competencies over time.

2.4. Phase 3: interrupted time series analysis

We conducted an interrupted time series study design to assess changes in CMD screening rates among AGYW seeking routine care after the SPE intervention. Our primary outcome was the proportion of clinic visits with a documented CMD screening. Secondary outcomes included type of CMD screening performed, proportion of visits that included brief counselling and triage of active CMD symptoms, and proportion of visits that resulted in referral.

2.4.1. Clinical record data abstraction

Two staff members abstracted clinical medical record data from Thika sub-County Hospital from January 4–November 26, 2021. The SPE training occurred over 3 days from August 21–24, 2021. For this analysis, the pre-SPE period is from January 4–August 21, 2021. The post-SPE period is from August 25–November 26, 2021. Data were abstracted for all clinic visits among AGYW who were: ages 16–25 years, female at birth, and currently seeking HIV prevention or treatment services, including HIV testing, PrEP, or ART. We developed and piloted our abstracted form to ensure data availability in the hospital records, including both paper-based and electronic charts. Abstracted data included: identification number (to link records for AGYW with multiple clinic visits during the study period); demographics (i.e., age, relationship status); HIV status and services sought (e.g., reason for clinic visit, HIV status, length of time receiving HIV services at that clinic, and medication adherence); and mental health services provided (i.e., screening, counselling, and referrals). Chart notes included information on whether any CMD screening was conducted at a visit, the type of CMD screened for, screening tool used, and the result of the screening. They also included open text fields describing the quality and nature of any counseling conducted and referrals provided. Counselling was defined as any counselling topic related to CMDs (e.g., depressive symptoms, gender-based violence, trauma). Any screening tool related to CMD was included in the abstraction. Medical records may have reported that a screening for a particular CMD was performed but did not include the tool used. Providers at the clinic were trained in and had access to one screening tool alcohol use [CAGE-AID/CRAFFT (32, 33)], one for depressive symptoms [PHQ-9 (34)], one for general mental health [SRQ-20 (35)] and one for posttraumatic stress symptoms ["Post Rape Care" (PRC) form (36)]. Alcohol use and PRC forms were included in electronic medical records (EMR) while depressive symptom and general mental health tools were completed by hand and kept in the patient's physical file. In cases where abstracted records included a CMD screening tool score, we used the following cutoffs: the SRQ-20 screening results used a depressive symptom cutoff of 7 (35) and the PHQ-9 used depressive symptom cutoffs of 5–9, 10–14, 15–19, and 20–27 to indicate mild, moderate, moderately severe, and severe levels of depressive symptoms, respectively (34).

2.4.2. Statistical analysis

We used descriptive statistics (frequencies, medians) to summarize demographic information, CMD service outcomes, and HIV-related outcomes. We used an interrupted time series design to compare CMD screening rates before and after the introduction of our SPE training. CMD screening rates were calculated by dividing the number of clinic visits with any CMD screening conducted by the total number of clinic visits each week (aggregated by week to account for daily fluctuations in clinic volume). We used scatterplots to identify the underlying trend in CMD screening, any seasonal patterns in CMD screening and clinic visit frequency, and outliers. Models were fit using generalized linear regressions with log link, Poisson distributions, and robust standard errors. Exposure to the SPE training was coded as a binary variable for the pre/post SPE periods.

We assessed autocorrelation of the interrupted time series through partial autocorrelation function (PACF) plots and in cases where we found meaningful and significant autoregression we conducted a sensitivity analysis using an autoregressive integrated moving average (ARIMA) model. We also performed several additional sensitivity analyses, including: (1) aggregating CMD screening rates by day to consider more granular changes in CMD screening proportion; (2) aggregating CMD screening rates by month to account for monthly fluctuations in CMD screening proportions and clinic volume; and (3) truncating data in the week immediately after the SPE intervention to account for potential Hawthorne effect (alteration of study subject behavior due to awareness of being observed) (37).

Due to the small number of clinic visits with any counselling or referrals conducted, we descriptively summarized the proportion of clinic visits with CMD counseling or referrals provided, among clients who had any CMD screening conducted. Chi-square statistics were used to quantify any statistically significant differences in proportion of visits results in counseling and referral between the pre-SPE and post-SPE periods.

2.5. Ethical considerations

Institutional review boards at the University of Washington and Kenya Medical Research Institute Scientific and Ethics Review Unit (KEMRI SERU) approved this study. All participants provided written informed consent in English or Kiswahili before participation in the in-depth interviews and SPE training in phases 1 and 2. AGYW were not consented for medical record abstraction in phase 3. We received a written agreement from the Thika sub-County Hospital prior to beginning data abstraction and only abstracted de-identified data.

3. Results

3.1. Provider competence

Provider competency scores increased across the four mock encounters as indicated by the average rating on the standardized competency checklists. Specifically, the 10 providers had a mean competency score of 8.1 [standard deviation (SD): 1.1] for their first simulated patient encounter compared with a mean score of 13.7 (SD: 1.7) for their fourth simulated patient encounter (p-value <0.001). The largest improvement in scores was between the first and third case (average of 3.1-point difference in mean score between the first and third cases), whereas there was a smaller improvement observed between the third and fourth cases (average of 1.6-point difference in mean competency score between these cases). Checklist sub-scores also improved across the four cases for both the CMD-specific and interpersonal competencies in the checklist. We observed a statistically significant improvement in the mean score for three items around screening for CMDs, accurately assessing next steps in care based on screening results and making appropriate referrals (from 3.1 on the first encounter to 7.9 on the fourth encounter, $p = 0.02$).

TABLE 1 Demographic and HIV service outcome among AGYW seeking care at Thika sub-County Hospital between January and November 2021.

	Total (*N* = 1,154)	Pre-SPE (*N* = 769)	Post-SPE (*N* = 385)	*p*
Age (median, IQR)	21 (19–23)	21 (19–23)	22 (19–24)	0.022
Number of school years completed (median, IQR)	14 (12–14)	14 (12–14)	13.5 (12–14)	0.290
Missing	866 (75.04%)	565 (73.47%)	301 (78.18%)	
Job/occupation				0.110
Student	314 (27.21%)	214 (27.83%)	100 (25.97%)	
Missing	700 (60.66%)	451 (58.65%)	249 (64.68%)	
Current marital status				0.568
Single, no partner	672 (58.23%)	461 (59.95%)	211 (54.81%)	
Single with partner	142 (12.31%)	94 (12.22%)	48 (12.47%)	
Married (husband has one wife)	184 (15.94%)	119 (15.47%)	65 (16.88%)	
Widowed	8 (0.69%)	5 (0.65%)	3 (0.78%)	
Divorced/separated	19 (1.65%)	12 (1.56%)	7 (1.82%)	
Missing	129 (11.18%)	78 (10.14%)	51 (13.25%)	
Earns own income	118 (10.23%)	84 (10.92%)	34 (8.83%)	0.104
Missing	452 (65.04%)	199 (63.38%)	253 (66.4%)	
HIV status				0.016
Positive	888 (76.95%)	608 (79.06%)	280 (72.73%)	
Negative	266 (23.05%)	161 (20.94%)	105 (27.27%)	
Reason for clinic visit				<0.001
HIV treatment	877 (76.00%)	599 (77.89%)	278 (72.21%)	
HIV testing or prevention (e.g., PrEP)	243 (21.06%)	162 (21.07%)	81 (21.04%)	
Other[a]	34 (2.95%)	8 (1.04%)	26 (6.75%)	
Months receiving services at clinic[b] (median, IQR)	60 (12–144)	72 (12–144)	60 (10–144)	0.352
Missing	201 (17.42%)	102 (13.26%)	99 (25.71%)	
Morisky medication adherence score				
Good	100 (8.67%)	77 (10.01%)	23 (5.97%)	0.123
Inadequate	12 (1.04%)	9 (1.17%)	3 (0.78%)	
Poor	9 (0.78%)	6 (0.78%)	3 (0.78%)	
Not completed	1,033 (89.51%)	677 (88.04%)	356 (92.47%)	0.065
Missing	7 (0.61%)	5 (0.65%)	2 (0.52%)	

[a] Other responses included: GBV ($n = 33$), counselling services ($n = 1$).

[b] Among AGYW living with HIV.

We also found statistically significant improvements in mean score for two items around adolescent-friendly communication skills of active listening and asking clarifying questions (from 1.6 on the first encounter to 5.8 on the fourth encounter, *p*-value = 0.01).

Mean scores around provider knowledge and self-rated competencies for mental health service delivery significantly increased from before the SPE training to the end of the training. Providers had a mean knowledge score of 26.1 (SD: 3.2) prior to the training and 37.8 (SD: 4.7) after the training (*p*-value: 0.01). Their mean reported self-efficacy score was 29.8 (SD: 3.6) prior to the training and 38.5 (SD: 5.1) after the training (*p*-value: 0.02).

3.2. Pilot findings on SPE effectiveness for CMD screening

A total of 1,154 medical records abstracted, of which 769 (66.7%) were from the pre-SPE training period and 385 (33.3%) were from the post-SPE training period. Throughout the study, 528 individual women were seen at the clinic; Most had only one visit during this study ($n = 310$, 58.7%), 55 had 2 visits (10.4%), 42 had 3 visits (8.0%), and 121 had 4 or more visit (22.9%). The median age of AGYW seeking care at Thika sub-County Hospital in this time frame was 21 years [interquartile range (IQR): 19–23; Table 1]. Based on abstracted data throughout the study, approximately 28% of AGYW seeking HIV services in the clinic were in school ($N = 314$) and most were single with no partner ($n = 672$, 58.23%). The proportion of AGYW who were living with HIV and seeking care at the clinic differed between the pre- and post-SPE periods (79.06% vs. 72.73%, respectively; $p = 0.02$). Specifically, compared to the pre-SPE period, fewer AGYW had clinic visits for HIV treatment (72.21% vs. 77.89%, $p < 0.01$) and more attended the clinic for other reasons such as GBV counselling (6.75% vs. 1.04%, $p < 0.01$).

In the pre-SPE period, 114 of 769 (15%) of clinic visits included screening for CMDs, whereas, in the post-SPE period, 127 of 385 (33%) of clinic visits had a CMD screen ($p < 0.01$) (Figure 1). In both the pre- and post-SPE periods, substance use was the most CMD screened for (11.1% of visits pre-SPE, 22.6% of visits post-SPE). No visits had a screening completed for depression or anxiety in the pre-SPE period compared to 19 visits (4.9%) post-SPE training. The most common screening tool reported in medical records was the PRC form (3% of visits pre-SPE, 6% of visits post-SPE), followed by CAGE-AID/CRAFFT (1% of visits pre-SPE, 5% of visits post-SPE), SRQ-20 (0% of visits pre-SPE, 4% of visits post-SPE), and PHQ-9 (0% of visits pre-SPE, 2% of visits post-SPE). In visits where the SRQ-20 was completed, five AGYW had an elevated symptoms score. In visits where the PHQ-9 was completed, two AGYW had mild depressive symptoms, one had moderately severe depressive symptoms, and one had severe depressive symptoms.

The median number of AGYW clinic visits per week was 22 (IQR: 17–31) (Figure 2). There was no significant difference in the number of clinic visits per week between the pre- and post-SPE periods (pre-SPE median = 20 visits, IQR: 17–27; post-SPE median = 24.5 visits, IQR: 19–31; $p = 0.18$). The estimated proportion of CMD screens at baseline (first week of medical record abstraction—January 2021) was 22% (Table 2). We found a statistically significant 2.6-fold higher proportion of AGYW screened for CMDs the week immediately after SPE training for providers (RR: 2.57, 95% CI: 1.34–4.90, $p < 0.01$). The estimated proportion of CMD screens went from 8.3% the week before the SPE training to 20.5% the week after the SPE training. Prior to SPE training, there was an estimated 3% decrease in CMD screens among AGYW each week (RR: 0.97, 95% CI: 0.95–0.99, $p < 0.01$). The 3 months following the SPE training resulted in an 11% relative increase in CMD screening proportion compared to the 7 months pre-SPE (RR: 1.11, 95% CI: 1.04–1.17, $p < 0.01$) (Figure 3). Sensitivity analyses showed similar effect sizes and magnitudes and are fully presented in Supplementary File 3.

3.3. CMD counselling and referral outcomes

Of 241 visits with a CMD screen, 30 visits (26%) in the pre-SPE period and 36 visits (28%) in the post-SPE period had any counselling at that same visit ($p = 0.72$) (Figure 1). Of the visits that recorded both a screening tool and counselling ($n = 58$), 4 reported elevated depressive symptoms with the PHQ-9 and 4 reported elevated symptoms from the SRQ (Table 3). Counselling topics were predominantly focused on traumatic stress and gender-based violence (pre-SPE: $N = 27$, 3.5% of clinic visits; post-SPE: $N = 26$, 6.8% of clinic visits), with fewer counselling sessions on general topics related to mental health and well-being, such as relationships (pre-SPE: $N = 2$, 0.3%; post-SPE: $N = 8$, 2.1%) and suicidal ideation (pre-SPE: $N = 1$, 0.1%; post-SPE: $N = 2$, 0.5%). Of all visits with a CMD screen, 1 visit (3%) in the pre-SPE period and 6 visits (17%) in the post-SPE period had any counselling at that same visit ($p = 0.08$) (Figure 3). Referrals were made to community health volunteers (pre-SPE, $N = 1$), child psychologists (post-SPE, $N = 2$), and psychiatrists (post-SPE, $N = 4$).

4. Discussion

In this pilot study of a simulated patient encounter implementation strategy to improve integrated mental health and HIV service delivery in Kenya, we found a significant ($p < 0.01$) association between our SPE training and CMD screenings conducted among AGYW seeking HIV-related services. Specifically, CMD screening proportions more than doubled, from around 8% the week before the SPE training to 21% the week after the SPE training. The proportion of CMD screenings continued to increase over time after the intervention, with an estimated 50% of clinic visits including a CMD screening by the end of the study period suggesting that providers possibly felt more comfortable conducting CMD screens over time. Provider competencies around adolescent-friendly mental health service delivery also improved after training. Our findings highlight the promise of the SPE training approach in promoting CMD service-delivery for adolescents in HIV clinic settings.

Kenyan MOH guidelines recommend screening for depression and alcohol use regularly within HIV care settings (38). While we found a relative increase in the proportion of CMD screens conducted at clinic visits after our SPE-training, a small number of visits overall included screening for depression or anxiety (only 5% of screens after SPE-training) while most of the screening increases seemed to be driven by greater use of substance and alcohol use screening tools. At this clinic, both the substance and alcohol use and the gender-based violence screening tools are integrated into electronic medical records (EMR) while the PHQ-9 and SRQ-20 are done by hand and kept in a patient's physical file. Additionally, depression and anxiety assessments are mostly done for clients with poor adherence and high viral load. Consequently, we believe that reasons for higher use of substance and alcohol use screening tools include convenience and familiarity of EMR-based tools compared to those for depression and anxiety, concerns about time and effort to deliver screening tools for depression and anxiety, and existing clinic practices for use of depression and anxiety tools. Screening for depression and anxiety, specifically, in HIV care settings is critical to support Kenyan integrated care targets and address the high burden of these conditions among AGYW at risk or living with HIV (39). A study of AGYW in Kenya found that 34% of AGYW with moderate to severe depression had a high HIV risk score (indicating high likelihood of HIV acquisition) (40). One study in Tanzania estimated that 27% of AGYW in an HIV prevention trial had moderate to severe depression, with many reporting experiences of sexual trauma (42%) (41). Despite the evidence of a high burden of depression in this population, no clinic visits screened for depression or anxiety in the 6 months preceding the SPE training and only 5% of clinic visits screened for depression or anxiety after training.

SPEs have been used internationally to improve training in both HIV and mental health care (22). A study using a SPE training for HIV service providers in Kenya found improvements in HIV

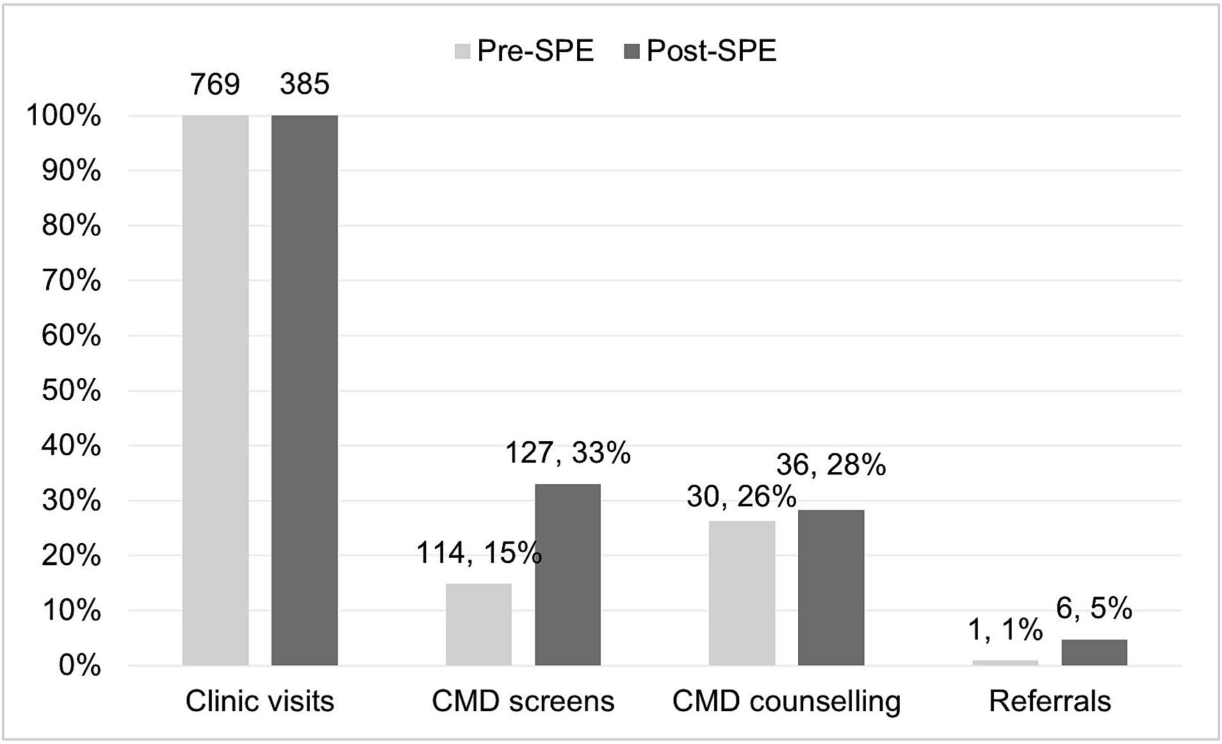

FIGURE 1
Common mental disorder (CMD) treatment cascade*. *CMD screens represented as proportion of clinic visits; CMD counselling and referrals represented as proportion of visits with a CMD screen.

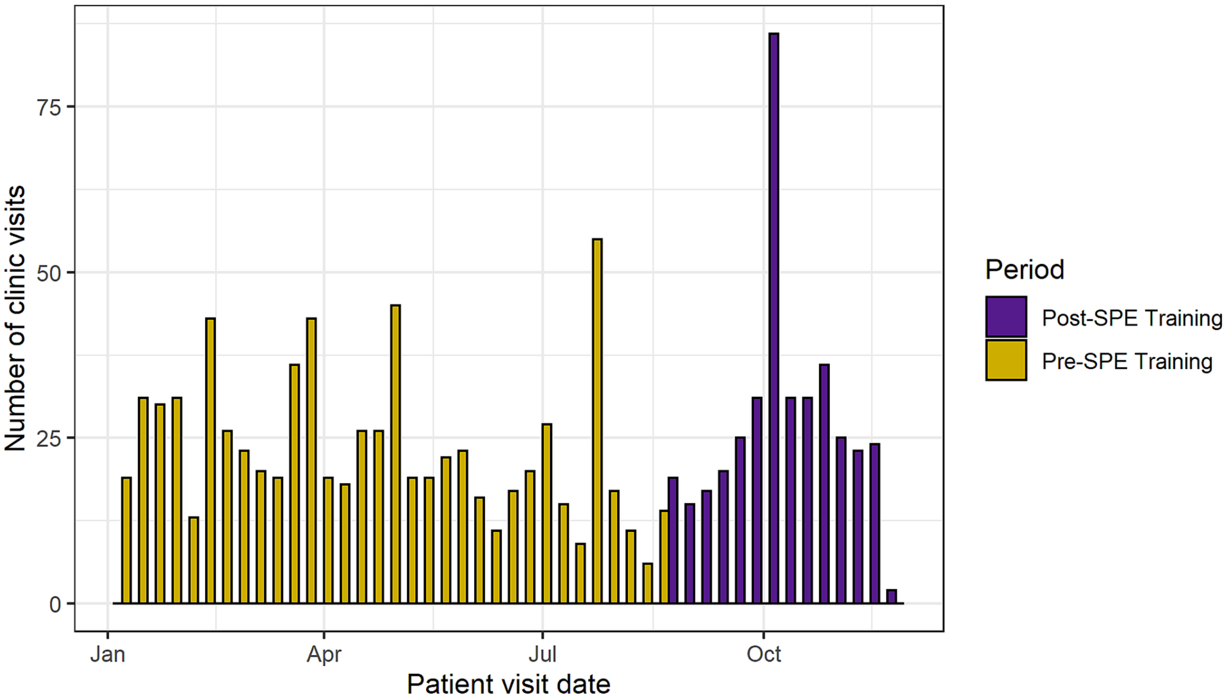

FIGURE 2
Total number of clinic visits by week.

prevention and PrEP counseling including interpersonal skills, use of guidelines, and adolescent-friendly communication after the training (22, 42). SPE trainings for mental health have also found substantial improvements in CMD screening associated with the training among primary care providers in the United States (43). Our study adds to this body of literature by focusing on care integration and training HIV providers around CMD service delivery specifically.

Several potential mechanisms may explain the improvements seen in the proportion of AGYW clinic visits with a CMD screen after versus before the SPE training. Using an SPE training strategy gives providers space to practice competencies with realistic patients. The SPE training used in our study follows Kolb's model of experiential learning which includes four stages of learning: (1) concrete experience, or having the actual experience, (2) reflecting on the experience, (3) abstract conceptualization, or learning from the experience, and (4) active experimentation by trying out what was learned (27). We saw marked improvements in provider competencies throughout the training indicating a higher level of provider comfort and familiarity with providing CMD care within HIV care settings. The experiential learning model also supports the continued increases in CMD screening rates we found in the 3 months following training since concrete experience and active experimentation (stages 1 and 4) may lead to increased comfort or knowledge in conducting CMD screenings over time (27).

TABLE 2 Results from an interrupted time series model of proportion of CMD screenings over time.

	β	Exp (β)	95% CI	*p*-value
Intercept	−1.49	0.22	0.16–0.31	<0.0001
Trend pre-SPE[a]	−0.03	0.97	0.95-0.99	0.004
Immediate change	0.94	2.57	1.34–4.90	0.004
Change in trend post-SPE[b]	0.10	1.11	1.04–1.17	0.001

[a] 769 visits pre-SPE.

[b] 385 visits post-SPE.

Approximately one fourth of visits where a CMD screening was performed also included counselling. The most discussed topic of the counselling sessions was traumatic stress and gender-based violence and these visits predominantly reported using the PRC screening tool. AGYW experiencing gender-based violence are at a heightened risk of both HIV and depressive disorders (1, 4, 44). A study of gender-based violence and HIV in Tanzania and South Africa found that 31% of young women screened positive for GBV and only 10% requested referrals (45), highlighting the need for interventions to address these topics within HIV care settings. We found a similar proportion of clinic visits with some counseling conducted (among those when screening for CMDs was also conducted) between the pre- and post-SPE training periods, suggesting that additional support for providers is to address the need for counselling services. Given the high rates of gender-based violence and traumatic stress among AGYW at risk and living with HIV, future studies should look at targeted intervention strategies to address these topics.

While this SPE training model could be expanded to focus on additional topics such as counseling skills and competencies, it is important to note that this study was completed in a context where HIV providers are often limited in their time with a patient. Screening and referrals (both of which occurred more often after the SPE intervention) can be easily integrated into existing HIV care, provided that adequate referral resources exist outside of the clinic. Integrating mental health care (such as counselling) into HIV systems may require

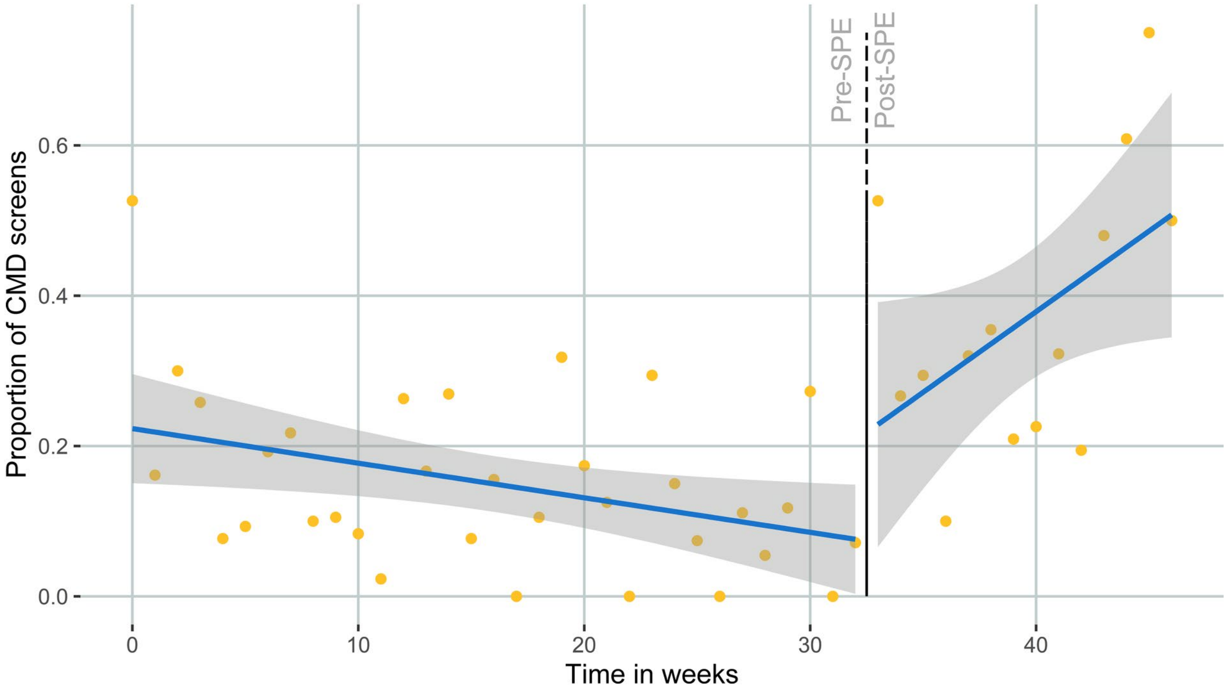

FIGURE 3
Proportion of clinic visits with a CMD screen, before and after SPE training.

TABLE 3 Counselling and screening tools recorded at visits with a CMD screen ($n = 241$).

	N^a	% of CMD screens ($n = 241$)^a
Counselling recorded[b]	**62**	**25.7%**
CAGE-AID/CRAFFT	2	0.8%
PHQ 9	6	2.5%
No depressive symptoms	2	0.8%
Mild	2	0.8%
Moderately severe	1	0.4%
Severe	1	0.4%
PRC	49	20.3%
SRQ	7	2.9%
No depressive symptoms	3	1.2%
Depressive symptoms	4	1.7%
No tool identified[b]	4	1.7%
No counselling recorded	**180**	**16.2%**
CAGE-AID/CRAFFT	28	11.6%
PHQ	1	0.4%
No depressive symptoms	1	0.4%
PRC form	1	0.4%
SRQ	9	3.7%
No depressive symptoms	8	3.3%
Depressive symptoms	1	0.4%
No tool identified	140	58.1%

[a] Sub-categories may not add up to bolded totals if more than one screening tool was used at a clinic visit.
[b] Four visits reported counselling but no CMD screen at the visit.

further task shifting among HIV care providers, for example training nurse counsellors or staffing an additional cadre of lay providers depending on workload and capacity, to support HIV providers in providing this type of counseling to AGYW (46).

This study had a number of strengths and limitations. Our findings on associations between the SPE training and CMD screening rates were robust and consistent across several sensitivity analyses and sustained through at least 3 months post-intervention. Our SPE training was also rigorously developed based on a formative qualitative process. However, this pilot study included a single clinic and did not include a control group, limiting our ability to detect a causal relationship between CMD screening and SPE training. The time frame of our study prevented us from accounting for seasonality and time-varying confounders such as COVID-19 outbreaks, which may have an impact on a provider's ability to conduct CMD screening and the need for CMD screening from a patient perspective. Additionally, we cannot evaluate the sustainability of the training after 3 months, or how the effects may be sustained in cases of staff attrition. Our interrupted time series analysis relied on chart abstraction of clinic visits, which may have misclassified information on the outcome of CMD screening tools, details of counselling topics, or other mental health related assessments. For example, clinic visits were categorized as having no CMD screen if none was found in the abstracted medical record, but it is possible that providers did perform a screen and did not record it. It is also possible that providers conducted CMD screenings and counselling before the SPE intervention but recorded them with more accuracy post-training. To the extent that was the case, our findings would be biased to show a larger effect of the SPE training than truly occurred. Although we did not measure accuracy of recorded medical records, improved reporting of CMD screenings in medical records could be considered an unintended benefit of this intervention as it may help with resource allocation, follow-up, or appropriate referral. Finally, our analysis only looked at changes in the proportion of CMD screens (and any counseling or referrals provided). We did not collect data on quality of mental health care, fidelity to the mental health training post-SPE, or clinical outcomes such as receipt of mental health psychotherapy or pharmacotherapy, improved CMD symptoms, or improved adherence to HIV prevention or treatment care in our pilot study. It is also important to understand if actions taken after screening were consistent with screening outcomes. Therefore, future work is needed to consider clinical and implementation outcomes related to the provision of adequate, integrated mental health and HIV services for AGYW (1).

In conclusion, our SPE model is a promising implementation strategy for improving HIV provider competencies and CMD service delivery for adolescents in HIV clinics. Gaps remain, however, around high burden CMDs, such as depression, and achieving MOH targets of screening all AGYW for CMDS at HIV service delivery appointments. Additional research is needed to explore long-term effects of SPE training on adolescent clinical outcomes in larger trials. Future SPE training approaches could incorporate targeted training on high burden conditions (e.g., depression, anxiety) among AGYW seeking HIV services.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by University of Washington and Kenya Medical Research Institute Scientific and Ethics Review Unit. The studies were conducted in accordance with the local legislation and institutional requirements. The ethics committee/institutional review board waived the requirement of written informed consent for participation from the participants or the participants' legal guardians/next of kin because Kenyan age of consent is 16 years and therefore parental consent was not needed for participants between ages 16 and 18. No participants were included under the age of 16.

Author contributions

JV and KN conceptualized the research and methodology and acquired funding. RN, BK, EO, and GM were responsible for data collection and management. PM, KN, NM, and CK conducted project oversight and operational management. PK, SD, and PC advised on the actor case scripts and the SPE training intervention. TC and JV conducted the analysis and wrote the original draft of the manuscript. BW contributed to analysis approach and interpretation. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1209525/full#supplementary-material

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Implementation of trauma-informed care and trauma-responsive services in clinical settings: a latent class regression analysis

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Introduction: Engagement and retention in health care is vital to sustained health among people living with HIV (PLWH), yet clinical environments can deter health-seeking behavior, particularly for survivors of interpersonal violence. PLWH face disproportionate rates of interpersonal violence; clinical interactions can provoke a re-experiencing of the sequalae of trauma from violence, called re-traumatization. Trauma-informed care (TIC) is a strengths-based approach to case that minimizes potential triggers of re-traumatization and promotes patient empowerment, increasing acceptability of care. Yet, Ryan White HIV/AIDS clinics, at which over 50% of PLWH received care, have struggled to IMPLEMENT TIC. In this analysis, we sought to (1) identify unique sub-groups of HIV clinics based on clinical attributes (i.e., resources, leadership, culture, climate, access to knowledge about trauma-informed care) and (2) assess relationships between sub-group membership and degree of implementation of TIC and trauma-responsive services offered.

Methods: A total of 317 participants from 47 Ryan White Federally-funded HIV/AIDS clinics completed a quantitative survey between December 2019 and April 2020. Questions included assessment of inner setting constructs from the Consolidated Framework for Implementation Research (CFIR), perceived level of TIC implementation, and trauma-responsive services offered by each respondent's clinic. We employed latent class analysis to identify four sub-groups of clinics with unique inner setting profiles: Weak Inner Setting (n = 124, 39.1%), Siloed and Resource Scarce (n = 80, 25.2%), Low Communication (n = 49, 15.5%), and Robust Inner Robust (n = 64, 20.2%). We used multilevel regressions to predict degree of TIC implementation and provision of trauma-responsive services.

Results: Results demonstrate that clinics can be distinctly classified by inner setting characteristics. Further, inner setting robustness is associated with a higher degree of TIC implementation, wherein classes with resources (Robust Inner Setting, Low Communication) are associated with significantly higher odds reporting early stages of implementation or active implementation compared to Weak class membership. Resourced class membership is also associated with availability of twice as many trauma-responsive services compared to Weak class membership.

Discussion: Assessment of CFIR inner setting constructs may reveal modifiable implementation setting attributes key to implementing TIC and trauma-responsive services in clinical settings. Introduction.

KEYWORDS

trauma-informed care, Ryan White HIV/AIDS clinics, HIV/AIDS, latent class analysis, implementation science

1. Introduction

Engagement and retention in health care is vital to population health, yet clinical environments can reduce acceptability of care and deter health-seeking behavior. This is particularly true for individuals with experiences of interpersonal violence. Encompassing any intentional use or threat of use of power or force against another person or group that could result in injury, harm, maldevelopment, deprivation, or death (1), interpersonal violence includes, not exhaustively: sexual violence [experienced by approximately 44% of women and 23% of men in the United States (US)] (2); physical intimate partner violence (22% of US women, 14% of US men) (2); adverse childhood experienced (ACEs, 1 in 7 US children) (3); hate crimes (20% of sexual and gender minority Americans) (4); and, aggravated assault (experienced by approximately 1 in 500 people) (1). There are significant differences in exposure to violence by race, ethnicity, sexual orientation, gender identification, geographic location, and more (1).

In health care interactions, stimuli can trigger past experiences of interpersonal violence, resulting in re-traumatization or re-experiencing of the initial trauma and the physical and psychological reactions to it. Anticipation of re-traumatization can lead to health care avoidance (5), as can previous negative health care experiences (5, 6), exacerbating the negative physical and mental health outcomes associated with trauma (6–8). Providers may be unaware of their patients' history of trauma (9), increasing the potential for unknowingly employing behaviors which may be perceived as similar to an abuser (e.g., disempowerment) (5), potentially resulting in re-traumatization. Trauma-informed care (TIC) is an evidence-based approach to care delivery that minimizes the risk of re-traumatization, thereby making care more acceptable and comfortable to patients with trauma histories (10–15), and thus may be able to improve care engagement and retention (15). Individuals with experiences of interpersonal violence who perceive greater integration of TIC in settings where they receive services endorse feeling more empowerment, having better emotional regulation, and experiencing less social withdrawal, leading to better mental and physical health outcomes (16).

People living with HIV (PLWH) experience disproportionately high rates of interpersonal violence, while also requiring frequent interaction with the healthcare system for continued antiretroviral (ART) prescription and care. Most PLWH experience intimate partner violence (IPV, 68–95% of cisgender women, 68–77% of cisgender men, 93% of transgender PLWH) (17–19), while 30% of PLWH have experienced childhood physical or sexual abuse. Additionally, PLWH experience community violence and hate crimes motivated by bias sexuality, gender identity, race, religious and social conservatism, and poverty (4, 20, 21). In addition to trauma-associated negative physical and mental health outcomes, PLWH who experience interpersonal violence have worse HIV-related outcomes, including less consistent medication adherence (22), lower CD4 cell count (22, 23), higher HIV viral load (23), and more opportunistic infections (24). Low or varied engagement in care may contribute to this, marking clinical HIV care environments as spaces in vital need of enhanced trauma-informed practices.

Despite this need, and the evidence of the positive impact of trauma-informed practices, federally-funded Ryan White HIV/AIDS clinics (RWCs) and other clinical settings have faced barriers to TIC implementation. These barriers often hinge upon characteristics of the clinical environment, including available resources such as having adequate staff and time (25, 26), leadership engagement supportive of changing practices (27, 28), availability of training on TIC (26), and networks and communications (26). The Consolidated Framework for Implementation Research (CFIR) (29) classifies these constructs as falling within the *inner setting* of the organization. Health services research demonstrates the critical nature of constructs within the inner setting for successful programmatic implementation, including of trauma-informed practices (25–28). However, most research on the inner setting characteristics of organizations focuses on the impact of individual constructs on implementation, rather than understanding the totality of inner setting attributes as they collectively contribute toward implementation of a new evidence-based practice. Improved understanding of the variable nature of the inner setting as a whole rather than individual constructs in isolation from each other can inform tailored and comprehensive combinations of strategies to promote implementation of new clinical practices, including TIC.

The goal of this study was to examine the relationship between combinations of CFIR-derived inner setting features present in RWCs and TIC implementation in these vital care settings. We employed a latent class analysis to identify subgroups of Ryan White HIV/AIDS clinics in the Southeastern US (a region with a disproportionate burden of HIV/AIDS) that have unique profiles of modifiable inner setting characteristics (based on CFIR). Identification of clinic subgroups with common inner setting strengths and gaps allows researchers to better tailor implementation strategies to the unique context of each group to strengthen delivery of TIC in these vital clinical settings serving PLWH. Therefore, the objectives of this research are (1) identify subgroups of Ryan White HIV/AIDS clinics based on their unique profiles of inner setting characteristics and (2) assess how subgroup membership is related to degree of TIC implementation and number of trauma-responsive services offered.

2. Materials and methods

2.1. Study design and setting

Data included in this analysis are from a larger mixed-methods study of CFIR inner and outer setting factors influencing the adoption and implementation of TIC in RWCs in the Southeastern US (30, 31). RWCs are federally funded clinics that provide primary care, medication, and support services to people living with HIV who are under- or uninsured; those in the Department of Health and Human Services (DHHS) Region IV (Southeastern US) serve geographic area encompassing 53% of new HIV diagnoses in the U.S. (32). These clinics vary considerably in their structural characteristics and implementation environments, spanning the states of Kentucky, Tennessee, North Carolina, South Carolina, Mississippi, Alabama, Georgia, and Florida.

2.2. Participants

Eligible participants were employed by an RWC in DHHS Region IV as an HIV care provider (i.e., physician, advanced practice provider), staff member (those who provide clinical and social support services, i.e., nurses, social workers, medical assistants, intake staff, and patient educators), or administrator (i.e., clinical coordinator, program manager). Participants were recruited through emails sent by regional RWC point-of-contacts, in-person at the national Ryan White providers conference, and via advertising in the newsletter for the DHHS Region IV Southeast AIDS Education and Training Center. Efforts were made to sample from all DHHS Region IV states in a representative manner through additional recruitment focused on states with a low initial participant yield. Additional details are available elsewhere (30, 31).

2.3. Data collection

Between December 2019 and April 2020, individuals interested in participating in the study were provided with a link to read the consent form, provide informed consent, and complete the online survey. Surveys were approximately 60 min long, self-administered, and hosted by the platform Alchemer. Participants received $30 in compensation upon completion of the survey. All study procedures were approved by the Emory University Institutional Review Board.

2.4. Measures

2.4.1. Participant characteristics

Participants provided information about their demographic characteristics, including age, gender (female, male, non-binary), race (Black, White, other), and ethnicity (Hispanic vs. non-Hispanic). Demographic categories were collapsed due to small cell sizes. Additionally, participants were asked about their tenure at their RWC in years, and their current position: Manager/Administrator/Center Coordinator, Clinical Provider (Nurse Practitioner, Physician Assistant, certified Nurse Midwife, Physician), Nurse, Medical Assistant, Health Educator/Counselor/Patient Navigator, or Social Worker/Case Manager. Finally, personal support for TIC was operationalized using the ARTIC subscale for personal support for TIC (Cronbach $\alpha = 0.66$), which is comprised of 5 items, each with a 7-point bipolar scale response set in which higher numbers indicate more personal support for TIC (33).

2.4.2. Clinic characteristics

Participants were asked about the characteristics of their clinic, including clinic type, whether or not the clinic was academically affiliated, and whether or not mental health, substance use, and social support services were available on site. Clinic type was classified as stand-alone HIV clinic, health department, hospital-based HIV clinic, Federally Qualified Health Center, community clinic, or other. For analysis, clinic type was collapsed into hospital-based or non-hospital based. If participants from the same clinic gave disparate answers, the response with the highest frequency was applied to that clinic. Clinic state and urbanicity were determined using the US Census Bureau 2010 rural–urban classification system. Additional clinic characteristics included whether or not the following services were offered (yes/no): HIV primary care, family planning/obstetrics and gynecology (OBGYN) services, dental services, social services, substance use services, pediatric/adolescent services, and pharmacy services.

2.4.3. CFIR inner setting

Implementation constructs were measured as part of a 140-item instrument adapted from the National Center of Family Homelessness' Trauma-Informed Care Toolkit (34). Five aspects of implementation were assessed: Training and Workforce Development; Physical Environment; Screening, Assessment, and Treatment Services; Engagement and Involvement; and, Cross-sector Collaboration. Questions within each aspect were mapped onto three of the five CFIR inner setting constructs.

2.4.3.1. Culture

Culture was comprised of five variables. Staff culture (14 items), patient engagement and involvement at the clinic (12 items), provider-staff communication (1 item), integration of services (1 item), and use of multidisciplinary teams (1 item) had response options on a four-point Likert scale, from “Strongly Disagree” to “Strongly Agree.” Example questions are available in Supplementary Table S1. For staff culture and patient engagement and involvement, scores from all items were summed, and then dichotomized using a median split, so that 1 = median or above and 0 = below median. A median split was chosen based on visual inspection of the distribution of data, outlined in the scoring instructions, and to account for significant skew. For provider-staff communication, integration of services, and use of multidisciplinary teams, each item was dichotomized so 1 = strongly agree and 0 = do not strongly agree, due to the distribution of the responses. For all items, respondents who indicated “I do not know” were classified as “disagree” or “below median.”

2.4.3.2. Implementation climate

Implementation climate was measured using four items with response options on a five-point Likert scale, from “Strongly Disagree” to “Strongly Agree.” Example questions are available in Supplementary Table S1, and address receptivity to organizational change. Responses across the four items summed, and then dichotomized using a median split, so that 1 = median or above and 0 = below median, in line with scoring instructions and to account for skew in the distribution.

2.4.3.3. Leadership engagement

Leadership engagement (3 items) was measured on a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Example questions are available in Supplementary Table S1. Responses were summed across items, and dichotomized using a median split, so that 1 = median or above and 0 = below median.

2.4.3.4. Availability of resources

Availability of resources such as funding and time (5 items) was measured on a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Availability of training related to trauma (23 items) was measured on a four-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Example questions are available in Supplementary Table S1. For each indicator, responses across items were summed, and then dichotomized using a median split, so that 1 = median or above and 0 = below median. Ever receipt of training specifically on TIC (regardless of if the training was associated with their role(s) at the RWC) was measured using a dichotomous measure (yes/no).

2.4.3.5. Knowledge of TIC

Knowledge of TIC was measured using a 10-point visual analog scale, with the prompt, "On a scale of 1–10, with 1 being no knowledge about what TIC consists of and 10 being extremely knowledgeable about what TIC consists of, how would you rate yourself?" Knowledge scores were dichotomized using a median split, so that 1 = median or above and 0 = below median.

2.4.4. Implementation of TIC

Perceived degree of TIC implementation was assessed using a single ordinal item. Participants were asked, "To what extent has your clinic started to implement TIC?" Response options included "Not at all. There have been no discussions about TIC within my clinic that I'm aware of," "We have not started yet, but we have had discussion about TIC within my clinic," "We are in the early stages (e.g., have held a clinic-wide training, have conducted an organization assessment)," and "We are in the process of implementing new trauma-related practices or improvements (e.g., adopted enhanced trauma screening and assessment practices, adopted processes enhanced linkage to trauma-specific treatments/services)."

2.4.5. Availability of trauma-responsive services

Perceived availability of trauma-responsive services was assessed using seven items. Response options were on a four-point Likert scale, from "Strongly Disagree" to "Strongly Agree." Responses were dichotomized, so that 0 = disagree, services are not available, and 1 = agree, services are available. Respondents who indicated "I do not know" and non-responses were classified as "services are not available." Services assessed included (1) opportunities for care coordination for services not provided within the organization; (2) education for patients about traumatic stress and triggers; (3) access to a clinician with expertise in trauma and trauma-related interventions (on-staff or available for regular consultation); (4) opportunities for patients to receive a variety of services (e.g., housing, employment, legal and educational advocacy, and health, mental health and substance abuse services); (5) referral to counseling when mental health services are needed (i.e., individual therapy, group therapy and/or family therapy); (6) opportunities for patients to express themselves in creative or nonverbal ways (i.e., art, theater, dance, movement, music); and (7) opportunities for patients to practice mindfulness, reflection, or meditation, or offers to link patients to such opportunities. Dichotomized scores for each item were summed to create a continuous measure of number of services offered, with a possible range of 0–7.

2.5. Statistical analysis

2.5.1. Latent class analysis

Sample characteristics were computed using SAS version 9.4. Participants ($N = 317$) for whom inner setting data were available were included in the analysis. Latent class analysis, a human-centered analytic strategy that allows for identification of mutually exclusive patterns of attributes through mixture modeling, was used to identify latent classes. We ran successive fixed-effects latent class models in MPlus using Maximum Likelihood Estimation, beginning with a two-class model. All inner setting constructs detailed above were entered into the model. Successive models added one additional class each, continuing until model fit no longer improved based on the Akaike information criteria (AIC), Bayesian information criteria (BIC), sample size adjusted BIC (aBIC), entropy, and latent class probabilities. A final four-class model was selected using model fit criteria, with consideration for theoretical significance, meaningfulness of classes, and parsimony.

2.5.2. Bivariate and regression analysis

Latent class membership was imported in SAS 9.4. Bivariate statistics were computed for class membership with participants characteristics and clinic structural characteristics. Using the PROC GLIMMIX function in SAS, we ran two sets of multilevel models accounting for clustering at the clinic level using a random intercept, and with covariates significant at the bivariate level (participant clinic role, dichotomized into clinical vs. non-clinical, participant race, clinic urbanicity, and clinic academic affiliation) or theoretically significant (participant personal support for TIC). First, we ran a multilevel ordinal logistic regression with the outcome variable of degree of implementation of TIC. Second, we ran a multilevel linear model with the outcome variable of number of trauma-responsive services offered.

3. Results

3.1. Latent class analysis

A four-class latent class model was selected as the final model, based on fit criteria (Free Parameters: 47, AIC: 3861.339, BIC: 4038.007, aBIC: 3888.934, Entropy: 0.879), latent class probabilities (0.937, 0.954, 0.905, 0.945), meaningfulness, and parsimony. The four classes demonstrated unique profiles (Figure 1). Fit statistics for all computed models are reported in Supplementary Table S2.

Class 1: Weak Inner Setting ($N = 124$) included participants whose affiliated clinics were generally low resourced, including having low

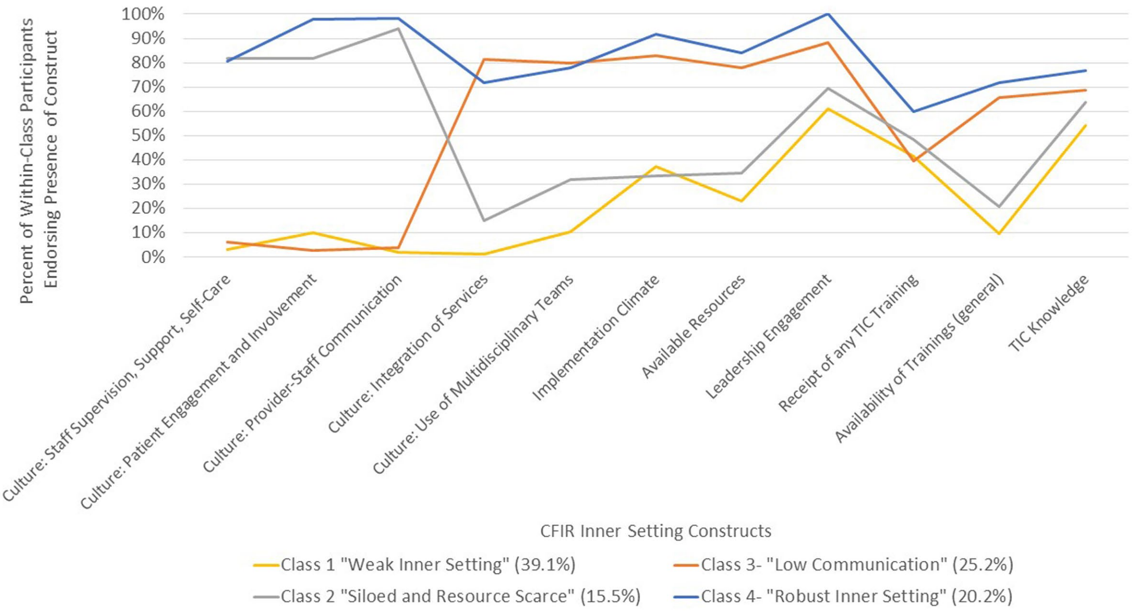

FIGURE 1
Inner setting latent variable four-class solution.

access to training, and an unfavorable culture for implementation. However, approximately 60% of Class 1 participants indicated their clinical leadership was supportive of TIC implementation, and slightly over 50% had above-median knowledge of TIC. Compared to other classes, Class 1 was considered to have a "weak" inner setting.

Class 2: Siloed and Resource Scarce ($N=49$) encompasses participants who reported a positive culture of communication, fair leadership engagement, and fair knowledge of TIC, but fewer than half reported integration of services, multidisciplinary teams, and a positive implementation climate. Further, resources, including general and TIC-specific trainings, were generally not available at these clinics.

Class 3: Low Communication ($N=80$) included participants who rarely indicated positive culture around communication in the clinic, and only 40% of whom had received any training in TIC. However, approximately 70% had above-median knowledge of TIC, while non-communication indicators of culture, implementation climate, and other indicators were endorsed as positive by most participants.

Class 4: Robust Inner Setting ($N=64$) contained participants who endorsed the agreement with the presence of, or above-median scores, at a rate of 60% or above for all indicators. Receipt of any training on TIC was the only indicator endorsed by less than 70% of the class. As such, Class 4 was classified as having a robust inner setting.

3.2. Participant characteristics

Study participants were primarily female-identifying, worked in a variety of positions in their clinic, and primarily identified as Black or White (Table 1). Participants worked at their clinic for an average of 5.66 years (SD:5.85), and were on average supportive of TIC (mean score: 5.18, possible range: 1–7). Some individual characteristics varied across latent classes- clinic roles of respondents were significantly different across classes, as were racial distribution of participants and personal support for TIC.

3.3. Associated clinic characteristics

Generally, clinics provided HIV primary care (91.8%), though infrastructure to provide other types of care was variable (Table 2). Approximately half of participants identified their clinics as being affiliated with hospital, while approximately 60% were academically affiliated, and about 65% located in urban areas. Only being affiliated with a hospital and working at a clinic in an urban context were significantly different across latent classes.

3.4. Implementation of TIC and trauma-responsive services

Participants identified their clinics as being approximately evenly divided between the four degrees of TIC implementation (Table 3): Not started, no discussions yet (25.87%); not started, but some discussions ongoing (22.4%); started, but in the early stages of implementation (24.61%); and started and actively implementing TIC (27.13%). Degree of implementation was statistically significantly different across classes. Participants were also asked if their clinic provided a set of trauma-responsive services in regular practice. Approximately half or more of participants agreed that each service was offered at their clinic, with clinics offering an average of 5.21 services, out of 7 services queried. Availability of each of these services, and the total number of services offered, varied significantly across latent classes.

Table 4 presents the results of multilevel ordinal logistic regressions with level of implementation of TIC as the dependent variable. Compared to participants in Low Communication (class 3) clinics, Weak Inner Setting (class 1) clinic participants had 3.6 times the odds of judging their clinic as not yet actively implementing TIC, 4.4 times the odds of not yet being in the early stages of implementing TIC, and 4.8 times the odds of not yet having discussions about TIC (aOR = 3.677, 95% CI:2.017, 6.703; aOR = 1.366, 95% CI:2.16, 8.60; aOR = 4.788, 95% CI:2.061, 11.122). These differences were even more stark compared to participants in clinics with Robust Inner Setting (class 4) clinics, wherein Weak Inner Setting (class 1) clinic participants had 4.5 to 6 times higher odds of reporting not yet actively implementing TIC, not yet being in the early stages of TIC implementation, or not yet having discussions about TIC (aOR = 4.560 95% CI:1.379, 8.741; aOR = 4.912 95% CI:2.281, 10.576; aOR = 6.044, 95% CI:2.164, 16.879, respectively). Similar, though slightly lower magnitude associations were demonstrated when comparing Siloed and Resource Scare (class 2) clinics to Low Communication (class 3) clinic participants (aOR = 2.192, 95% CI:1.070, 4.489; aOR = 2.474, 95% CI:1.116, 5.480; aOR = 3.661, 95% CI:1.366, 9.812) and Robust Inner Setting (class 4) clinic participants (aOR = 2.718, 95% CI:1.262, 5.856; aOR = 2.783, 95% CI:1.148, 6.745; aOR = 4.622, 95% CI:1.459, 14.640). There were no statistically significant differences in the odds of implementation level between Inner Setting Weak (class 1) and Siloed and Resource Scarce (class 2) clinics, nor were there between Low Communication (class 3) and Robust Inner Setting (class 4) clinics.

Compared to participants in Weak Inner Setting (class 1) clinics, participants in Low Communication (class 3) and Robust Inner Setting (class 4) clinics reported significantly higher number of services available (Table 5), with an average of 2.24 additional services available in Low Communication inner setting clinics (95% CI: 1.7825, 2.6988) and an average of 2.17 additional services available in Robust Inner Setting clinics (95% CI: 1.6781, 2.6607).

4. Discussion

The Ryan White network is a robust system of federally-funded clinics offering HIV clinical and support services across the US. They are subject to centralized training, evaluation, and feedback mechanisms, which enable systematic implementation of new programs, including TIC. A key part of ending the HIV epidemics, RWCs serve the plurality of PLWH in the US, warranting support in their efforts. While regulations within the Ryan White System may produce a level of similarity across RWCs, these clinics are located across a variety of geographic, demographic, political, and workforce contexts, which significantly influence the clinical inner setting. Using latent class analysis, we identified four sub-groups of RWCs based on CFIR inner setting constructs, and assessed their associations with degree of implementation of TIC and availability of trauma-responsive services. One group endorsed limited inner setting strength ("Weak Inner Setting"), which was associated with being the least likely to

TABLE 1 Individual characteristics of total and by latent class membership ($N = 317$)*.

Individual characteristic	Total	Latent class				
		Class 1, "weak inner setting"	Class 2, "siloed and resource scarce"	Class 3, "low communication"	Class 4, "robust inner setting"	*p*
Admin/Office staff	44 (13.88)	12 (9.68)	4 (8.16)	20 (25.0)	9 (12.5)	**0.0065**
Clinical provider	55 (17.35)	31 (25.0)	12 (24.49)	4 (5.0)	8 (12.50)	
Health education, counselor, or patient navigator	30 (9.46)	11 (8.87)	7 (14.39)	4 (5.0)	8 (12.50)	
Manager, admin, or center coordinator	61 (19.24)	18 (14.52)	11 (22.45)	19 (23.75)	13 (20.31)	
Medical assistant/Other	38 (11.99)	14 (11.29)	4 (8.16)	13 (16.25)	7 (10.94)	
Nurse	49 (15.49)	23 (18.55)	3 (6.12)	12 (15.0)	11 (17.19)	
Social worker/Case manager	40 (12.62)	15 (12.10)	8 (16.33)	8 (10.0)	9 (14.06)	
Female (*N* = 310)	264 (85.16)	103 (85.12)	39 (81.25)	71 (89.87)	51 (82.26)	0.5084
Male	42 (13.55)	17 (14.05)	9 (18.75)	7 (8.86)	9 (14.53)	
Non-binary	4 (1.29)	1 (0.83)	0 (0.0)	1 (1.27)	2 (3.23)	
White	139 (43.85)	64 (51.61)	28 (57.14)	25 (31.25)	22 (34.38)	**0.0047**
Black	127 (40.06)	39 (31.45)	15 (30.16)	38 (47.50)	35 (54.69)	
Other	51 (16.09)	21 (16.94)	6 (12.24)	17 (21.25)	7 (10.94)	
Clinic tenure, M (SD)	5.66 (5.85)	6.06 (6.23)	5.90 (6.16)	5.377 (5.73)	5.07 (5.00)	0.6846
Personal support for TIC, *M* (*SD*) (*N* = 315)	5.18 (1.12)	4.96 (1.02)	4.80 (1.04)	5.33 (1.15)	5.72 (1.33)	**<0.0001**

*Total may not add to 100% due to missing data. Bolded values are significant at a level of $p < 0.05$.

TABLE 2 Clinic characteristics by total and latent class membership ($N = 317$).

Structural characteristic		Total	Class				
			"Weak inner setting"	"Siloed and resource scarce"	"Low communication"	"Robust inner setting"	*p*-value
Academically affiliated ($N = 277$)	Yes	161 (58.12)	75 (64.66)	25 (40.48)	28 (52.54)	33 (55.00)	0.1671
	No	126 (41.88)	41 (35.34)	17 (59.52)	31 (47.46)	27 (45.00)	
HIV primary care	Yes	291 (91.80)	117 (94.35)	42 (85.71)	70 (87.50)	62 (96.88)	0.0541
	No	26 (8.20)	7 (5.65)	7 (14.29)	10 (12.50)	2 (3.13)	
Obstetrics and gynecology care	Yes	186 (58.68)	70 (56.45)	30 (61.22)	46 (57.50)	40 (62.50)	0.8457
	No	131 (41.32)	54 (43.55)	19 (38.78)	34 (42.50)	24 (37.50)	
Dental services	Yes	194 (61.20)	68 (54.84)	29 (59.18)	52 (65.00)	45 (70.31)	0.1776
	No	123 (38.80)	56 (45.16)	20 (40.82)	28 (35.00)	19 (29.69)	
Social services	Yes	233 (73.50)	91 (73.50)	38 (77.55)	53 (66.25)	51 (79.69)	0.2903
	No	84 (26.50)	33 (26.61)	11 (22.45)	27 (33.75)	13 (20.31)	
Substance use services	Yes	144 (45.43)	54 (43.55)	30 (61.22)	30 (37.50)	30 (46.88)	0.0661
	No	173 (54.57)	70 (56.45)	19 (38.78)	50 (62.50)	34 (53.13)	
Pediatric services	Yes	128 (40.38)	52 (41.94)	25 (51.02)	31 (38.75)	20 (31.25)	0.1924
	No	189 (59.62)	72 (58.06)	24 (48.98)	49 (61.25)	44 (68.75)	
Pharmacy services	Yes	228 (71.92)	87 (70.16)	39 (79.59)	55 (68.75)	47 (73.44)	0.5541
	No	89 (28.08)	37 (29.84)	10 (20.41)	25 (31.25)	17 (26.56)	
Urban	Yes	211 (66.56)	95 (76.61)	39 (79.59)	38 (47.50)	39 (60.94)	**<0.001**
	No	106 (33.44)	29 (23.39)	10 (20.41)	42 (52.50)	25 (39.06)	
Hospital affiliated	Yes	164 (51.74)	75 (60.48)	30 (61.22)	25 (31.25)	34 (53.13)	**<0.001**
	No	153 (48.26)	49 (39.52)	19 (38.78)	55 (68.75)	30 (46.88)	

Bolded values are significant at a level of $p < 0.05$.

have begun implementing TIC, and offering the fewest trauma responsive services. Two groups ("Low Communication" and "Siloed and Resource Scarce") demonstrate moderate inner setting strength, with variability in which inner setting constructs were identified by participants; "Low Communication" inner setting clinics had higher odds of actively implementing TIC than "Weak Inner Setting" clinics and offered more trauma-responsive services, while "Siloed and Resource Scarce" settings did not. Membership in the "Robust Inner Setting" group was associated with the highest odds of implementation. Tailoring implementation strategies to address the needs of these sub-group will facilitate more effective implementation of TIC in RWCs.

Approximately 20% of clinics are classified within the "Robust Inner Setting" sub-group, approximately 70% of which are already implementing TIC (early stages or actively implementing). These clinics likely need the least support in beginning or continuing TIC. Training and technical assistance may be sufficient to enhance their implementation, with a focus on TIC-specific training and knowledge generation, which were endorsed as the weakest constructs for this group.

"Low Communication" RWCs- classified as having moderate inner setting strength- endorsed slightly lower levels of active implementation than strong inner setting clinics (39% vs. 47%), but similar numbers of trauma-responsive services. "Low Communication" clinics were more likely to be located in rural areas, and more likely to not be affiliated with a hospital than other clinics; the lack of communication infrastructure demonstrated by "Low Communication" clinics may be related to relative the isolation of these clinics, while other clinics benefit from hospital systemic-integrated communication pathways. Representing approximately 25% of the sample, "Low Communication" clinics endorsed similar availability of training and other resources, leadership engagement, implementation climate, integration of services, and use of multidisciplinary teams, yet a distinguishing difference was they reported markedly lower staff supportive practices such as trauma-informed supervision, support, and self-care practices, patient engagement and involvement, and provider-staff communication in comparison to strong inner setting clinics. This may indicate that while resources, leadership engagement, and service integration are sufficient for establishing and/or maintaining availability of trauma-responsive services, such as connecting patients to onsite mental or behavioral health services, strategies to enhance communication between providers, staff, and patients may be necessary to facilitate robust implementation of patient-centered trauma screening, assessment and coordinated care. Critically, evidence suggests that working with patients with trauma and complex needs can contribute to compassion fatigue, secondary stress and burnout (35–38) and provider burnout has been associated with lower willingness to learn new skills and implement organizational change (39–41). Thus, "Low Communication" clinics may benefit from support in developing robust staff support systems, including opportunities for interpersonal and professional communication such as support groups and

TABLE 3 Trauma-informed care and provision of trauma services by total and latent class membership.

CFIR inner setting construct or sub-construct		Total	Class				
			"Weak inner setting"	"Siloed and resource scarce"	"Low communication"	"Robust inner setting"	*p*-value
TIC implementation	Not started, no discussions	82 (25.87)	50 (40.32)	16 (32.65)	10 (12.50)	6 (9.38)	**<0.001**
	Not started, some discussions	71 (22.40)	30 (24.19)	10 (20.41)	18 (22.50)	13 (20.31)	
	Started, early stages	78 (24.61)	29 (23.39)	13 (26.53)	21 (26.25)	15 (23.44)	
	Started, actively implementing	86 (27.13)	15 (12.10)	10 (20.41)	31 (38.75)	30 (46.88)	
Offer coordinated care for service not provided by org	Yes	278 (87.70)	94 (75.81)	44 (89.80)	79 (98.75)	61 (95.31)	**<0.001**
	No	39 (12.30)	30 (24.19)	5 (10.20)	1 (1.25)	3 (4.69)	
Offer education about trauma	Yes	189 (59.62)	37 (29.84)	25 (51.02)	70 (87.06)	57 (89.06)	**<0.001**
	No	128 (40.38)	87 (70.16)	24 (48.98)	10 (12.50)	7 (10.94)	
Offer access to clinician with trauma expertise	Yes	235 (74.13)	65 (52.42)	36 (73.47)	72 (90.00)	62 (96.88)	**<0.001**
	No	82 (25.87)	59 (47.58)	13 (26.53)	8 (10.00)	2 (3.13)	
Offer access to a variety of services	Yes	283 (89.27)	97 (78.23)	45 (91.84)	78 (97.50)	63 (98.44)	**<0.001**
	No	34 (10.73)	27 (21.77)	4 (8.16)	2 (2.50)	1 (1.56)	
Offer referrals to mental health services	Yes	300 (94.64)	108 (87.10)	48 (97.96)	80 (100.0)	64 (100.0)	**<0.001**
	No	17 (5.36)	16 (12.90)	1 (2.04)	0 (0.0)	0 (0.0)	
Offer opportunities for creative expression	Yes	158 (49.84)	37 (29.84)	15 (30.61)	63 (78.75)	43 (67.19)	**<0.001**
	No	159 (49.84)	87 (70.16)	34 (69.39)	17 (21.25)	21 (32.81)	
Offer opportunities for mindfulness	Yes	209 (65.93)	56 (45.16)	26 (53.06)	70 (87.50)	57 (89.06)	**<0.001**
	No	108 (34.07)	68 (54.84)	23 (46.94)	10 (12.50)	7 (10.94)	
Average # services offered	N (SD)	5.21 (1.91)	3.98 (1.98)	4.88 (1.56)	6.40 (1.43)	6.36 (0.95)	**<0.001**

Bolded values are significant at a level of $p < 0.05$.

TABLE 4 Odd ratios of implementation stage threshold by latent class membership.

	Odds of implementation stage below "actively implementing"		Odds of implementation stage below "early stages"		Odds of implementation stage below "some discussions"	
Inner setting class	aOR	95% CI	aOR	95% CI	aOR	95% CI
1 vs. 2 (ref)	1.678	0.875, 3.216	1.765	0.871, 3.576	1.308	0.598, 2.862
1 vs. 3 (ref)	**3.677**	**2.017, 6.703**	**4.366**	**2.216, 8.601**	**4.788**	**2.061, 11.122**
1 vs. 4 (ref)	**4.560**	**2.379, 8.741**	**4.912**	**2.281, 10.576**	**6.044**	**2.164, 16.879**
2 vs. 3 (ref)	**2.192**	**1.070, 4.489**	**2.474**	**1.116, 5.480**	**3.661**	**1.366, 9.812**
2 vs. 4 (ref)	**2.718**	**1.262, 5.856**	**2.783**	**1.148, 6.745**	**4.622**	**1.459, 14.640**
3 vs. 4 (ref)	1.240	0.640, 2.405	1.125	0.504, 2.513	1.262	0.402, 3.962

Bolded values are significant at a level of $p < 0.05$.

clinic-wide meetings that address stress, compassion fatigue and burnout. Also, to ensure new practices for screening, assessing and addressing trauma in clinical care are acceptable to patients and not unintentionally retraumatizing, these clinics should identify methods for patient feedback, such as evaluation surveys or community advisory boards.

"Siloed and Resource Scarce" clinics, encompassing approximately 15% of the sample, were also considered to have a moderate

TABLE 5 Beta estimates for number of trauma-responsive-services by latent class membership.

Inner setting type	Beta	95% CI
Class 1	Ref	–
Class 2	0.8166	0.3063, 1.3268
Class 3	**2.2406**	**1.7825, 2.6988**
Class 4	**2.1694**	**1.6781, 2.6607**

Bolded values are significant at a level of p <0.05.

implementation climate, with endorsement of a positive culture of communication, but had fewer multidisciplinary teams, integration of services, and lower availability of resources, including trainings, than "Robust Inner Setting" or "Low Communication" sub-groups. Implementation of TIC in these clinics had progressed further than in the "Weak Inner Setting" groups, but less than in clinics with greater resource availability (including "Low Communication" and "Robust Inner Setting" groups), indicating that resource availability may act as a threshold that must be met for progression along the TIC implementation continuum. In addition to training and technical assistance, leaders in "Siloed and Resource Scarce" clinics may need guidance or support from an external facilitator on how to integrate TIC practices within the constraints of their clinic and without overburdening staff, such as using a referral model for providing TIC services. Further, without many onsite services, focusing on adopting a referral model for providing TIC services may be ideal, which would require the building or expanding of external partnerships.

"Weak Inner Setting" clinics, by contrast, had low endorsement of most inner setting constructs, though over 50% indicated above-median leadership engagement and knowledge of TIC. Most clinics within this sub-group (approximately 65%) reported their clinics had conversations about TIC implementation, but had not progressed to any level of implementation. These clinics would likely require multiple strategies to overcome barriers to adopting and implementing TIC, requiring a more comprehensive implementation plan than other clinics. Notably, approximately 40% of RWCs surveyed were classified as "Weak Inner Setting," underscoring the high need for implementation support and resources in RWCs in the Southern U.S.

Despite differences across sub-groups, most clinics were providing at least some trauma-responsive services, such as offering coordinated care for services not provided by their organization (87.7%), offering referrals to mental health services (94.6%), and offering access to a variety of services beyond HIV care (89.3%). This is congruent with the Ryan White model of care, in which integrated service delivery is inherent to clinical structure. However, beyond the infrastructure provided by the RW network for base integrated services, variability in service offering is observable. Clinics with moderate "Low Communication" settings had higher odds of implementing TIC than "Weak Inner Setting" clinics, while "Siloed and Resources Scarce" clinics did not. This suggests that strengthening inner setting constructs in general facilitated TIC implementation, though some may be more effective than others.

There are limitations to the current study, including the use of non-probability sampling and self-administration of the survey, which may have resulted in incomplete or biased responses. Dichotomization of indicator variables reduces variability in responses that may be important for a more nuanced understanding of inner setting factors influential for implementation. Specifically, this could lead to a conservative estimate of the influence of these factors; further research should employ innovative methods for better understanding these latent variables. Similarly, the use of mode to categorize level of implementation of TIC may limit the nuance in assessment of implementation, but provided what could be considered closest to a consensus measure of the standard measures of central tendency. The reliability of the ARTIC assessment of personal support for TIC was lower than desirable, which may indicate heterogeneity of the items, or that the items do not form a single construct; however, the measures has been previously validated and all items were retained for comparison with extant literature. Additionally, all "do not know" responses were classified as below median, to minimize assumptions about presence of constructs. This may lead to underestimation of the salience of these constructs in certain settings, exaggerating the importance of factors not reported as "do not know." However, lack of awareness of constructs by clinic members may indicate insufficient salience or diffusion of the constructs, particularly when inner setting constructs involve all individuals in the clinic setting and are likely to be perceived by staff and providers. To facilitate interpretation of results, large numbers of indicators variable are not recommended for use in latent class analysis; therefore, this analysis does not include factors other than the inner setting, such as the environment in which RWCs exist, qualities of the intervention itself, the process of implementation, or characteristics of individuals implementing or receiving TIC. These factors may be highly influential in implementation, and may have interactive effects with the inner setting. However, research has consistently identified the importance of clinical inner settings for implementation (28-30), and latent class analysis allows for identification of latent patterns of inner setting characteristics that are the most salient, facilitating identification of modifiable targets for implementation technical assistance.

In conclusion, despite many common elements across RWCs stemming from requirements from the Ryan White HIV/AIDS program, there is discernable variation in the internal operating characteristics of RWCs across the Southeastern US which is associated with TIC implementation within this vital safety-net clinical network. Identifying sub-groups of RWCs with similar internal strengths and weakness pertaining to TIC implementation can facilitate tailoring of strategies to each subgroups' needs to facilitate and strengthen TIC implementation. To enable the transition to trauma-informed HIV care across the Ryan White clinical network, the Health Resources and Services Administration (HRSA) and other training and oversight agencies for the Ryan White HIV/AIDS program could offer tailored packages of strategies to RWCs thereby giving them the right tools they need to enhance internal operations for TIC implementation in their clinic. Future studies should build upon the completed objectives of this research, and evaluate the utility of these tailored strategies on TIC adoption and implementation across RWCs.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, upon reasonable request.

Ethics statement

The studies involving humans were approved by the Emory University Institutional Review Board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

KA: methodology, formal analysis, writing- original draft, writing-reviewing and editing. KP: formal analysis, writing-original draft, writing- review and editing. AK: methodology, writing-review and editing, supervision, funding acquisition. JS: conceptualization, methodology, investigation, resources, writing- original draft, writing-review and editing, supervision, funding acquisition. All authors contributed to the article and approved the submitted version.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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Depression and perceived stress among perinatal women living with HIV in Nigeria

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Background: Pregnancy and postpartum periods are crucial stages for women's mental health, and women living with HIV are particularly susceptible to depression and psychological stress due to various factors. This study investigated the prevalence and associated factors of depression and perceived stress among women living with HIV during their perinatal period in Ibadan, Nigeria.

Methods: A cross-sectional survey was conducted in three HIV treatment centers in Ibadan, Nigeria, among women living with HIV between the ages of 19 and 49 who were either pregnant or had given birth within the last 2 years. The study was conducted from September 2022 to December 2022. An interviewer-administered questionnaire was used to collect the data from the participants. Ethical approval and informed consent were obtained, and data were analyzed using the Statistical Package for Social Science version 26.

Results: The study included 402 participants, of whom 69.0 and 78.0% reported symptoms of depression and perceived stress, respectively. However, 15.2% of the participants have comorbid depression and stress. Positive partner status was significantly associated with lower perceived depression, while gestational age between 29 and 40 weeks was significantly associated with lower perceived stress. The co-occurrence of depression and perceived stress was associated with partner status, income level, family support, gestational age, and years on antiretroviral therapy.

Conclusion: The high prevalence of depression, perceived stress, and their co-occurrence among women living with HIV during the perinatal period call for incorporating mental health care into routine maternal healthcare for all women, particularly those living with HIV. This finding emphasizes the need for public health efforts to prioritize perinatal mental health and improve access to care and support for women and their partners.

KEYWORDS

depression, stress, HIV, pregnancy, mental health

Introduction

For decades, the HIV epidemic has remained a significant global health challenge, with an estimated 38 million individuals infected globally. Sub-Saharan Africa accounts for 71% of the worldwide population of people living with HIV (1), with a prevalence rate of 1.4% in Nigeria, making it the third most HIV-burdened country (1). Moreover, the burden of HIV in Nigeria is the highest among the female adult population and a known predisposition of maternal mortality with an estimated prevalence of 26.4% among pregnant cohorts (2, 3).

More women have symptoms of depression in comparison to men, and this gendered pattern exists among people living with HIV (4–6). Women living with HIV (WLHIV), especially in low and middle-income countries (LMICs), experience significant psychological challenges, such as depression, stress, and anxiety, due to their HIV diagnosis (7, 8). Studies have also shown that WLHIV is susceptible to more severe mental illness symptoms such as depression, anxiety, and posttraumatic stress disorder (6, 9).

Pregnancy and postpartum periods are some of the most vulnerable periods that may contribute to symptoms of depression in women (10). The prevalence of depressive symptoms among pregnant women ranges from 11.4 to 40.0%, which is higher than that of women generally (11, 12). In a study conducted in Nigeria, the prevalence of postpartum depression was 35.6% (13), while in Kenya, 44.2% (14) was reported among other locations where similar studies have been conducted. Furthermore, as previously reported in a study, mothers who experienced preterm deliveries had 5.75 times higher odds of developing symptoms associated with depression and anxiety compared to mothers who carried their pregnancies to full term. This elevated risk can be attributed to the unexpected nature of premature childbirth, catching the mothers off guard and leaving them unprepared for the delivery at that specific moment (14). Women's brains change structurally, psychologically, and behaviorally throughout pregnancy as they prepare for their new role as mothers (15). These changes, however, make pregnant women more prone to stress (16), which increases the likelihood of developing prenatal depression and stress symptoms (17).

Pregnancy can increase psychological susceptibility to WLHIV due to environmental factors, disclosure concerns, and HIV-related stigma (18). Studies conducted in LMICs have found that pregnant and postpartum WLHIV suffer from a high prevalence of depression and psychological stress (19–21). Similarly, a systematic review in Africa examined the prevalence of perinatal depression in HIV-infected women. The weighted mean prevalence of antenatal and postnatal depression was 23.4 and 22.5%, respectively (22). Depression is also associated with adherence to care and therapy among pregnant WLHIV (21), which may result in treatment failure and increased vertical HIV transmission (7). Psychological issues such as depression and stress may also adversely affect obstetric and neonatal outcomes and increase the risk of mother-to-child transmission (23).

Women, particularly in developing countries, are more likely to be exposed to risk factors such as poor socioeconomic status, making them more susceptible to perinatal depression (24). Depression and psychological stress may be critical barriers to HIV treatment and prevention as the conditions may be linked. In addition, women newly diagnosed with HIV during pregnancy and receiving a positive HIV diagnosis can generate worry and fear of transmitting the virus to an unborn child (25).

According to the Cohen and Wills Framework, the relationship between HIV-related stress and depression was assessed (26), focusing on the interplay between stress, social support, and their impact on an individual's well-being. The authors introduced the buffering hypothesis, which suggests that social support can act as a protective factor against the adverse effects of stress on an individual's mental and physical health (26). Hence, the framework explores how a strong social support system can mitigate the adverse consequences of stress, ultimately contributing to better overall psychological and physiological outcomes. This conceptual framework has been influential in understanding the role of social support in coping with various stressors and its implications for health and well-being (Figure 1) (26).

Pregnancy is a significant life change and can affect mental health, and the specific challenges WLHIV faces may exacerbate these effects. Therefore, it is essential to consider their holistic situation when providing care and support (20). Therefore, understanding the magnitude of depression and stress, as well as their associated factors, among perinatal WLHIV could provide important information that could aid in mitigating the poor mental health experienced by this group of women. This study is among the few studies investigating the prevalence of depression and psychological stress among WLHIV during pregnancy and the postpartum period in Nigeria. Thus, the study aims to determine the prevalence and factors associated with depression and psychological stress among WLHIV during their perinatal period in Ibadan, Nigeria, and to assess the relationship between HIV-related stress and depression among WLHIV.

Materials and methods

Study design and setting

This study was a facility-based cross-sectional survey conducted in three HIV treatment centers in Ibadan. The three centers providing HIV treatment were randomly selected from the twelve accredited ART facilities in Ibadan. The centers were State Hospital, Adeoyo, Ringroad; Adeoyo Maternity Health Centre; and St Annes Anglican Hospital, Molete. These health centers provide comprehensive HIV services and antenatal, delivery, and postnatal care for WLHIV in Ibadan, Oyo State.

Study population

The study population included women of known HIV status aged 18 years and above who were pregnant or had given birth within the last 2 years and receiving treatment at any of the three selected antiretroviral treatment centers in Ibadan, Oyo State. The women were consecutively selected over 5 weeks at the selected HIV treatment facilities. Women who were unable to provide informed consent were excluded from the study.

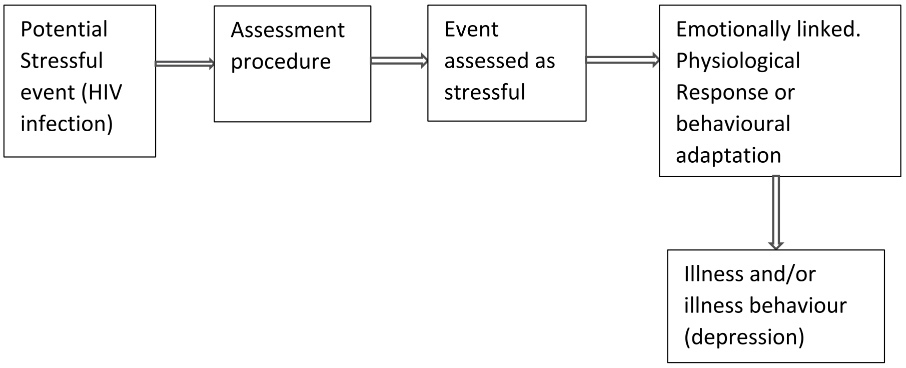

FIGURE 1
Conceptual framework on the relationship among HIV-related stress and depression among WLHIV (26).

Sampling method and sample size determination

The sampling method for this study was convenience sampling, a type of non-probability sampling technique. The study sample size was calculated according to the formula $N = Z\alpha^2 P\,(1 - P)/d^2$, where $Z\alpha$ is the Z statistic for a 95% confidence level, N is the sample size, P is the prevalence of WLHIV, and d is the precision. Using a confidence level of 95%, a precision level of 5%, and a design effect of 1.5, we calculated a minimum sample size of 384. We increased the sample size to 402 for potential missing data and non-response.

Data collection tool

The study used an interviewer-administered questionnaire to gather data on various demographic variables of the participants, including their age, level of education, primary occupation, and average monthly *per capita* income. In addition, the study questionnaire collected information on depression using the Edinburgh Postnatal Depression Scale (EPDS) (27, 28) and perceived stress using the Perceived Stress Scale-10 (PSS-10) (29, 30).

The EPDS was used to assess symptoms of perinatal depression. The scale has ten items with responses on a 4-point Likert scale ranging from 0 (absence of depressive moods) to 3 (worst mood). A score ranging from 0 to 30 is calculated, and a cut-off point of ≥12 indicates an increased likelihood of clinical depression (31). The scale does not mention pregnancy, child, birth, or infant and has also been validated in a non-pregnant population (31).

Perceived stress was measured using the Perceived Stress Scale. The Perceived Stress Scale (PSS) is a 10-item (32) self-report assessment of the stress domains of unpredictability, lack of control, burden overload, and stressful life circumstances. Responses are on a 5-point Likert scale ranging from 0 (never) to 4 (very often) (32). The PSS score is the sum of all responses, with higher scores indicating more perceived stress and can range from 0 to 40.

Before the main study, the EPDS and PSS-10 were pretested on a representative sample. Feedback on clarity and relevance was collected, and statistical analyses, including Cronbach's Alpha, affirmed their strong internal consistency (EPDS: $\alpha = 0.85$; PSS-10: $\alpha = 0.83$) and validity, ensuring their suitability for the research objectives.

Data collection procedures

The data collection was conducted between September 2022 and December 2022. All research assistants were trained before the commencement of the study on the research tools, interviewing skills, data management, and clarifications of ethical issues in research. The research assistants administered the questionnaires in English or the local language to participants who could neither read nor write.

Years on ART and gestational age were orally taken from the participants and confirmed from their case files with the healthcare providers at the clinic. The participants filled in partner status and Status disclosure to the partner, and it was confirmed from their case files if they had reported the partner status to the clinic.

The questionnaires were administered privately, and clarification and assistance were provided where necessary. The interviews took approximately 20 min to complete.

Statistical analysis

The data collected from the questionnaires were entered into Statistical Package for Social Science version 25 (SPSS 25) software for analysis. The demographic information of the study participants was summarized using descriptive statistics. Means and standard deviations were used to summarize continuous variables, while categorical variables were summarized using frequencies and percentages. The prevalence of depression and perceived stress were calculated as the proportion of participants who scored above the cut-off points on the EPDS and PSS-10 scales, respectively. Regression analyses were performed based on the categories of exposure and outcome variables. A logistic regression model was used when the outcome variable was dichotomized to determine the association between demographic, clinical, and pregnancy-related factors and depression and perceived stress. Crude models were made without any adjustments for covariates, and adjusted models were made similarly; all adjusted models were adjusted for age, sex, level of education, marital status, drinking, and smoking status, among other covariates. Independent variables were selected based on relevance to research questions, theoretical justification, and multicollinearity check. The level of significance was set at $p < 0.05$. Odds ratios (OR) and 95% confidence intervals (CI) were used to report the strength of the association between predictor variables and the outcomes of interest.

Ethical considerations

This study was conducted following the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the Lead City University Health Research and Ethics Committee (LCU-REC/22/125) and the Oyo State Ministry of Health Research Ethics Committee (AD 13/479/44539). Before administering the questionnaire, the participants were given information sheets outlining the study's objective and scope, which were duly explained to the participants in English or the local dialect (Yoruba/Pidgin). The participants were informed that participation in the study was voluntary and that they were free to withdraw from the study at any point without any consequences. The confidentiality and anonymity of the participants were ensured, and all data were kept confidential and were used only for research purposes. The participants were assured that participation or non-participation would not affect their access to healthcare services. In addition, participants who required psychological support after the study were referred to the appropriate healthcare professionals. The participants provided their written informed consent to participate in this study.

Results

Sociodemographic characteristics of participants

A total of 402 participants were eligible for this study, and the mean age of the study participants was 35.8 ± 6.60 years. 225 (56.0%) participants identified as Christians, 92.3% were married, and 352 (87.6%) were from the Yoruba tribe. 173 (43.0%) participants had attained a secondary school education, 334 (83.1%) were employed, and 234 (58.2%) earned an income below 20,000.00 NGN (<26.51 USD) (see Table 1).

TABLE 1 Sociodemographic characteristics of study participants (*n* = 402).

Characteristics	Total *n* = 402	Antenatal (*n* = 263) *N* (%)	Postpartum (*n* = 139) *N* (%)
Age (*n* = 402)			
Mean (S.D)	35.8 ± 6.60		
Religion			
Christianity	225	150 (57%)	75 (54%)
Islam	176	113 (43%)	64 (46%)
Tribe			
Yoruba	352	225 (85.6)	127 (91.4)
Igbo	29	21 (8)	8 (5.8)
Hausa	20	16 (6)	4 (2.9)
Others	1	1 (0.4)	0
Level of education			
Primary level	94	53 (20.2)	41 (29.5)
Secondary level	173	107 (40.7)	66 (47.5)
Tertiary level	90	68 (25.9)	22 (15.8)
None	45	35 (13.3)	10 (7.2)
Marital status			
Married	371	246 (93.5)	125 (89.9)
Divorced	9	6 (2.3)	3 (2.2)
Widowed	8	7 (2.7)	1 (0.7)
Separated	8	4 (1.5)	4 (2.9)
Single	6	0	6 (4.3)
Type of partner			
Spouse	373	247 (93.9)	126 (90.6)
Steady	11	7 (2.7)	4 (2.9)
Casual	10	7 (2.7)	3 (2.2)
None	8	2 (0.8)	6 (4.3)
Employment status			
Employed	334	225 (85.6)	109 (78.4)
Unemployed	68	38 (14.4)	30 (21.6)
Income level			
<20,000	234	157 (59.7)	77 (55.4)
20,000–30,000	48	19 (7.2)	29 (20.9)
31,000–40,000	77	60 (22.8)	17 (12.2)
41,000–50,000	27	13 (4.9)	14 (10.1)
>51,000	16	14 (5.3)	2 (1.4)

Relationship and support-related, clinical, and pregnancy-related characteristics of participants

Of the 402 participants, 335 were aware of their partner's status, with 152 having positive partners. 246 (61.2%) had disclosed their status to their partners, 318 (79.1%) reported receiving adequate support from their partners, and 287 (71.4%) reported receiving support from family and friends. 263 (65.4%) were pregnant with a gestational age range of 5–40 weeks. Only 73 (18.2%) women reported that the pregnancy was planned (see Table 2).

Prevalence of depression and perceived stress among WLHIV

Of the antenatal respondents, 154 (58.6%) reported low stress, while moderate stress was reported among 55.0 (20.9%) antenatal respondents, while high stress was reported among 54.0 (20.5%). Of most postpartum respondents, 80.0 (57.6%) reported moderate stress, and perceived stress was significantly associated with pregnancy status (see Tables 3, 4). The prevalence mean score of postpartum respondents with stress is 14.41 (±7.163), while the prevalence mean score of antenatal respondents with stress is 12.27 (±9.757; $p < 0.05$) (see Table 3).

Among the antenatal respondents, 117 (44.5%) were without depressive symptoms, while a majority of them, 146 (55.5%) were

TABLE 2 Support and pregnancy-related characteristics.

Characteristics	Total	Antenatal (n = 263) N (%)	Postpartum (n = 139) N (%)
Partners status(n = 402)			
Positive	157	118 (44.9)	39 (28.1)
Negative	245	145 (55.1)	100 (72.0)
Status disclosure to partner (n = 402)			
Yes	246	153 (58.2)	93 (66.9)
No	156	110 (41.8)	46 (33.1)
Support from partner			
Yes	318	218 (82.8)	100 (72)
No	76	43 (20.9)	33 (23.8)
Not applicable	8	2 (0.8)	6 (4.3)
Support from other family and friends			
Yes	287	204 (77.6)	83 (59.7)
No	115	59 (22.4)	56 (40.3)
History of conflict with partner			
Yes	128	80 (30.4)	48 (34.5)
No	274	183 (68.8)	91 (65.5)
Years on ART(n = 402)			
≤ 1 Year	85	50 (19)	35 (25.2)
≤ 5 Years	194	136 (51.7)	58 (41.7)
>5 Years	77	46 (17.5)	15 (10.8)
> 10 Years	46	31 (11.8)	31 (22.3)
Problems in previous pregnancy			
Yes	175	136 (51.7)	39 (28.1)
No	227	127 (48.3)	100 (71.9)
Planned pregnancy (n = 263)			
Yes	73	73 (27.8)	N/A
No	190	190 (72.2)	N/A
Gestational age (n = 263)			
5–13 weeks	109	109 (41.4)	N/A
14–28 weeks	85	85 (32.3)	N/A
29–40 weeks	69	69 (26.3)	N/A

found to be with depressive symptoms. Of the postpartum respondents, 28 (20.1%) respondents were without depressive symptoms, while a more significant proportion of 111 (79.9%) respondents exhibited depressive symptoms (see Table 3). Hence, it was found that the mean scores of the postpartum group is 13.32 (±6.479) and the antenatal group is 9.26 (±7.978; see Table 3). These results indicate a high prevalence of depressive symptoms among the respondents, with a higher proportion of respondents experiencing depressive symptoms in the postpartum period compared to the antenatal period.

A statistical association was observed between the level of stress and depression, and it was observed to be statistically significant at a p-value of 0.000. A high stress level was reported among the pregnant respondents who were reported to have depression symptoms (see Table 4). Furthermore, 61 (15.2%) respondents have a comorbidity of depression and stress.

Prevalence of respondents with suicidal thought

The result shows that among respondents without depressive symptoms, a small proportion of 3.00 (2.10%) individuals reported never having suicidal thoughts, while the majority of 133 (91.7%) respondents reported experiencing suicidal thoughts quite often. Only 1.00 (0.7%) respondents reported hardly ever having such thoughts, and 8.00 (5.5%) individuals reported experiencing suicidal thoughts sometimes.

In contrast, among respondents with depressive symptoms, 138 (53.7%) respondents reported never having suicidal thoughts. A smaller percentage of 52.0 (20.2%) individuals reported hardly ever experiencing such thoughts, and 57.0 (22.2%) respondents sometimes reported suicidal thoughts. Interestingly, only 10 (3.9%) individuals with depressive symptoms reported experiencing suicidal thoughts quite often.

Factors associated with depression among WLHIV

Assessing the factors associated with depression among WLHIV, the crude OR of some of the factors were reported to be significant factors that affect the depression level among WLHIV (see Table 5). However, after adjusting for other factors, age ranges between 25 and 30 years, income level below 40,000 NGN (51.58 USD) monthly, history of conflict with a partner, early and late gestational age problems with previous pregnancy, smoking, and alcohol usage and status disclosure were reported to remain significant factors that affect the depression level among WLHIV. Age (25–30 years), problems with a previous pregnancy, and smoking were the risk factors for the development of depression among WLHIV in Nigeria with OR = 3.324 (CI = 1.185–9.320), OR = 2.851 (CI = 1.546–4.260), and OR = 2.650 (CI = 1.038–6.771) respectively while other significant factors were observed to be protective (see Table 5).

Similarly, the factors associated with stress among WLHIV in Nigeria were assessed, and some of the statistically significant factors with stress among WLHIV in Nigeria at the crude OR remained significant after adjusting for potential confounders (income level, history of conflict with a partner, early and late gestational age, alcohol usage, and status disclosure). Women who have disclosed their status to their partners are about two times more likely to develop stress (OR = 2.094, CI = 1.191–3.682), while alcohol was observed to be a protective factor to the development of stress among WLHIV (OR = 0.357; CI = 0.170–0.752), early and late gestational age as well was observed to be a protective factor for the development of stress among WLHIV (OR = 0.158; CI = 0.070–0.357) and (OR = 0.049; CI = 0.019–0.126) respectively (see Table 6).

Among the several factors identified for stress and depression among WLHIV, income level, history of conflict with a partner, early and late gestational age, alcohol usage, and status disclosure were significant factors associated with stress and depression. After

TABLE 3 Prevalence of respondents with stress and depression among WLHIV.

Variable		Total *N* (%)	Antenatal (*n* = 263) *N* (%)	Postpartum (*n* = 139) *N* (%)	*p* value
Stress	Mean (SD)		12.27 (±9.757)	14.41 (±7.163)	
	Low stress	206 (51.2)	154 (58.6)	52 (37.4)	0.000*
	Moderate stress	135 (33.6)	55 (20.9)	80 (57.6)	
	High perceived stress	61 (15.2)	54 (20.5)	7 (5.0)	
Depression	Mean (SD)		9.26 (±7.978)	13.32 (±6.479)	
	Without depressive symptoms	145 (36.1)	117 (44.5)	28 (20.1)	0.000*
	With depressive symptoms	257 (63.9)	146 (55.5)	111 (79.9)	

*Values significant at a $p < 0.05$.

TABLE 4 Association between depression and perceived stress.

Variable	Overall depression	Depression		*p*-value
		Antenatal depression *N* (%)	Postpartum depression *N* (%)	
Low stress	65	39 (60)	26 (40)	0.000*
Moderate stress	131	53 (40.5)	78 (59.5)	
High perceived stress	61	54 (88.5)	7 (11.5)	

*Values significant at a $p < 0.05$.

adjusting for other factors, only three were reported to remain significant for comorbid depression and stress among WLHIV, including early and late gestational age, problems with previous pregnancy, and status disclosure (see Table 7).

Discussion

This study determined the prevalence and factors associated with depression and psychological stress among WLHIV during their perinatal period in Ibadan, Nigeria. The study results show a prevalence of 63.9 and 79.9% for depression and stress, respectively, among the respondents (20, 33). The prevalence of perinatal depression is higher than 38.4% in a similar study in Ethiopia (21). The prevalence of antenatal depression of 61.6% as measured by the EPDS with a cut-off ≥13 is slightly higher than the prevalence found in a previous study in Ekiti State, Nigeria (49.5%) (27), 47.6% in Addis Ababa, Ethiopia (21), and 52.5% in India among women on ART (29). The differences in prevalence might be due to differences in sociodemographic characteristics and tools used to assess depression. However, this finding buttresses the need to integrate mental health services into routine HIV care services, especially among women, to mitigate the adverse associated with maternal and child outcomes.

In the current study, the mean perceived stress was 12.27 among the pregnant and 14.41 among the non-pregnant respondents. This incident indicates moderate stress among WLHIV during the perinatal period. This finding is consistent with what was reported in another study in Nigeria, in which the mean perceived stress was moderate among the study population (31). The level of stress among the participants plausible predisposes to higher risks of mental disorders as it is in the general population and settings with social inequalities (32). Stress is a significant risk factor for depressive symptoms (34). Similar to other studies, it was found that women within the study sample who reported depressive symptoms (64.0%) reported significantly higher levels of perceived stress than women without depressive symptoms (28.0%).

This study used multivariate analysis to highlight factors associated with perinatal depression and perceived stress in a sample of WLHIV recruited from ART clinics. The study found that the status of the participants' partners was significantly associated with depression and perceived stress. According to the study, participants who earned below 20,000 NGN were 5.6 times more likely to report symptoms of depression and perceived stress. The results are consistent with those reported in studies in Ethiopia and South Africa, which presented that low income and unemployment were related to depression among HIV-positive women (24, 35). The reason could be that in low-income countries, women are pressured to default academics for poverty-related factors, resulting in more prominent engagement in domestic work and the lack of access to health education and awareness. This factor is ascribed to the possible negative interaction between mental disorders (e.g., depression) and poverty, primarily because, in principle, people with depression commonly perform poorly in their daily tasks (36). In addition, pregnancy may decrease their employability and even their potential to work (21) because of the impoverished labor women may need to undertake (37).

This study also revealed that having a problem with previous pregnancy was a risk factor for depression among WLHIV. According to the study, pregnant women within their first (5–13 weeks) and third (29–40 weeks) trimesters have lower chances of developing depression. In contrast to other research that has found no link between

TABLE 5 Factors associated with depression among women living with HIV.

Variables	Category	Crude OR 95%CL (lower-upper)	*p*-value	Adjusted OR 95% CI (lower-upper)	*p*-value
Age	19–24	9.706 (1.182–79.670)	0.034**	7.849 (0.745–82.640)	0.086
	25–30	1.594 (0.825–3.079)	0.165	3.324 (1.185–9.320)	0.022**
	31–36	1.908 (1.01–3.571)	0.043**	2.366 (0.895–6.259)	0.083
	37–42	1.458 (0.790–2.690)	0.228	1.659 (0.661–4.163)	0.281
	43–49	Ref		Ref	
Income level	<20,000	0.335 (0.074–1.512)	0.155	0.119 (0.016–0.882)	0.037**
	20,000–30,000	0.169 (0.035–0.825)	0.028**	0.108 (0.013–0.904)	0.040**
	31,000–40,000	0.119 (0.025–0.560)	0.007**	0.127 (0.017–0.944)	0.044**
	41,000–50,000	0.286 (0.053–1.539)	0.145	0.130 (0.013–1.327)	0.085
	>51,000	Ref		Ref	
History of conflict with partner	No	Ref		Ref	
	Yes	0.293 (0.173–0.498)	0.000**	0.216 (0.094–0.500)	0.000**
Gestational age	Postpartum			Ref	
	14–28 weeks	2.039 (0.984–4.227)	0.055	1.307 (0.486–3.511)	0.596
	29–40 weeks	0.105 (0.056–0.196)	0.000**	0.036 (0.013–0.098)	0.000**
	5–13 weeks	0.135 (0.071–0.257)	0.000**	0.097 (0.040–0.234)	0.000**
Problems in previous pregnancy	No	Ref		Ref	
	Yes	2.069 (1.352–3.165)	0.001**	2.851 (1.546–4.260)	0.001**
Smoking	No	Ref		Ref	
	Yes	2.360 (1.280–4.352)	0.006**	2.650 (1.038–6.771)	0.042**
Alcohol	No	Ref		Ref	
	Yes	0.137 (0.079–0.240)	0.000**	0.082 (0.035–0.193)	0.000**
Status disclosure	No	Ref		Ref	
	Yes	0.621 (0.405–0.953)	0.029**	0.523 (0.312–0.878)	0.014**

**Values significant at a $p < 0.05$.

gestational age and depression among women with HIV, our findings suggest that physiological changes during this stage may contribute to the onset of depression. Alternatively, the increased anxiety that women experience in the third trimester could also play a role (38, 39). This study indicates that problems in a previous pregnancy were significantly associated with the co-occurrence of depression and perceived stress. Our findings suggest that WLHIV who experienced complications in their previous pregnancy are twice as likely to report symptoms of depression and perceived stress compared to those who did not have such complications. This result could be because their complications were particularly severe and stressful for them. This result is consistent with previous studies highlighting a link between prior pregnancy complications and an increased risk of depression (40).

The prevalence of respondents with suicidal thoughts was examined, and the results indicate significant differences between those without depressive symptoms and those with depressive symptoms. Among respondents without depressive symptoms, a small proportion reported never having suicidal thoughts, while the majority experienced suicidal thoughts quite often. These findings are related to other studies conducted in Ethiopia (33), United States (41) and South Africa (42), which highlight the variability in the prevalence of suicidal thoughts among individuals with and without depressive symptoms. Most respondents with depressive symptoms did not report experiencing suicidal thoughts, which suggests that suicidal ideation may not be as prevalent in this population as anticipated (41, 42).

Further research is needed to understand the factors influencing the presence and severity of suicidal thoughts in individuals with depressive symptoms. Qualitative studies could provide valuable insights into the subjective experiences and contextual factors contributing to suicidal ideation. Such information would be crucial for developing targeted interventions and support systems to address the mental health needs of this population.

The study has several limitations that should be taken into consideration. Firstly, the sample used in the study was recruited from ART clinics, which may introduce sampling bias and limit the generalizability of the findings. The results may not represent all WLHIV in the general population who may not receive care at these clinics or be on ART. Secondly, the study design employed was cross-sectional, which hinders the establishment of causal relationships between the variables under investigation. A longitudinal study design would have been more suitable to determine the temporal relationship between perinatal depression, perceived stress, and associated factors. Thirdly, the study relied on self-report measures to assess depressive symptoms and

TABLE 6 Factors associated with stress among women living with HIV.

Variables	Category	Crude OR 95%CL (lower-upper)	*p*-value	Adjusted OR 95% CI (lower-upper)	*p* value
Age	19–24	2.923 (0.797–10.723)	0.106	2.927 (0.643–13.325)	0.165
	25–30	1.303 (0.678–2.502)	0.427	1.773 (0.746–4.215)	0.195
	31–36	1.487 (0.803–2.754)	0.207	1.448 (0.651–3.222)	0.364
	37–42	1.510 (0.819–2.786)	0.187	1.520 (0.689–3.353)	0.299
	43–49	Ref		Ref	
Income level	<20,000	0.158 (0.035–0.712)	0.016**	0.034 (0.006–0.199)	0.000**
	20,000–30,000	0.094 (0.019–0.459)	0.004**	0.028 (0.004–0.185)	0.000**
	31,000–40,000	0.069 (0.014–0.326)	0.001**	0.052 (0.009–0.302)	0.001**
	41,000–50,000	0.179 (0.034–0.944)	0.043**	0.098 (0.014–0.679)	0.019**
	>51,000	Ref		Ref	
History of conflict with partner	No	Ref			
	Yes	0.310 (0.176–0.546)	0.000**	0.423 (0.202–0.886)	0.023**
Gestational age	Postpartum	Ref		Ref	
	14–28 weeks	1.574 (0.915–2.709)	0.101	0.774 (0.377–1.589)	0.485
	29–40 weeks	0.128 (0.067–0.247)	0.000**	0.049 (0.019–0.126)	0.000**
	5–13 weeks	0.166 (0.085–0.324)	0.000**	0.158 (0.070–0.357)	0.000**
Problems in previous pregnancy	No	Ref		Ref	
	Yes	2.061 (1.381–3.077)	0.000**	1.722 (0.938–3.163)	0.080
Smoking	No	Ref		Ref	
	Yes	1.734 (1.026–2.930)	0.040**	1.750 (0.878–3.490)	0.112
Alcohol	No	Ref			
	Yes	0.290 (0.167–0.504)	0.000**	0.357 (0.170–0.752)	0.007**
Status disclosure	No	Ref			
	Yes	0.447 (0.297–0.674)	0.000**	2.094 (1.191–3.682)	0.010**

**Values significant at a $p < 0.05$.

TABLE 7 Factors associated with comorbid stress and depression among women living with HIV.

Variables	Category	Crude OR 95% CL (lower-upper)	*p*-value	Adjusted OR 95% CI (lower-upper)	*p* value
Problems in Previous Pregnancy	No	Ref		Ref	
	Yes	11.892 (5.475–25.831)	0.000**	7.034 (2.772–17.848)	0.000**
Alcohol	No	Ref	–	–	–
	Yes	0.183 (0.056–0.602)	0.005**	–	NS
Status disclosure	No	Ref		Ref	
	Yes	0.155 (0.083–0.290)	0.000**	0.269 (0.127–0.568)	0.010**
Gestational age	Postpartum	Ref		Ref	
	14–28 weeks	17.203 (7.367–40.170)	0.000**	7.034 (2.772–17.848)	0.000**
	29–40 weeks	0.224 (0.027–1.857)	0.166	0.161 (0.019–1.370)	0.095
	5–13 weeks	0.235 (0.277–0.033)	0.235	0.381 (0.044–3.294)	0.380

**Values significant at a $p < 0.05$; NS, not significant.

perceived stress, which are subjective and prone to recall or social desirability bias.

Moreover, the study's findings may have limited generalizability as it was conducted in a specific setting, namely Ibadan, Nigeria. Cultural, social, and economic factors unique to this context may have influenced the prevalence of depression and stress among WLHIV. Thus, caution should be exercised when applying these findings to other regions or countries.

Lastly, the study solely relied on quantitative data, neglecting qualitative data that could have provided a deeper understanding of the experiences and perceptions of WLHIV regarding perinatal depression and stress. Incorporating qualitative data would have provided richer insights into the lived experiences of WLHIV and the contextual factors contributing to mental health outcomes.

Addressing these limitations in future research would enhance the findings' validity, generalizability, and comprehensiveness, enabling a more nuanced understanding of perinatal depression and stress among WLHIV.

Conclusion

This study revealed a high prevalence of depressive symptoms among WLHIV during their perinatal period. Low income, previous pregnancy complications, and gestational stage were associated with depression and perceived stress. The findings highlight the need for integrating mental health services into routine HIV care to address the adverse outcomes associated with maternal and child health. Additionally, while the prevalence of suicidal thoughts was relatively low among respondents with depressive symptoms, further research is warranted to understand the complex interplay between depression and suicidal ideation. Comprehensive assessments and targeted interventions are essential to address the mental health needs of women living with HIV during the perinatal period.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

This study involving humans was conducted following the ethical principles of the Declaration of Helsinki. The study was approved by Ethics Committee of Lead City University, Ibadan (protocol code: LCU-REC/22/125) as well as from the Oyo State Ministry of Health Research Ethics Committee (protocol code: AD 13/479/44539). The study was conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individuals for the publication of any potentially identifiable images or data included in this article.

Author contributions

FA: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Visualization, Writing – original draft, Writing – review & editing. OA: Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. AL: Data curation, Formal analysis, Investigation, Methodology, Writing – original draft. SB: Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft. ZA: Data curation, Methodology, Writing – original draft. IA: Data curation, Methodology, Writing – original draft. MO: Data curation, Investigation, Methodology, Writing – original draft, Writing – review & editing. OO: Investigation, Methodology, Writing – original draft. AD: Data curation, Formal analysis, Investigation, Methodology, Writing – original draft. RS-A: Writing – original draft. AG: Data curation, Investigation, Methodology, Writing – original draft. DN: Data curation, Formal analysis, Methodology, Writing – original draft. AS: Writing – review & editing, Data curation, Investigation, Methodology, Writing – original draft. OE: Conceptualization, Data curation, Investigation, Validation, Visualization, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Factors influencing self-efficacy for self-management among adult people with human immune deficiency virus on antiretroviral therapy in public hospitals of south-west Ethiopia

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Introduction: Self-management is crucial for effective HIV management, and self-efficacy is a mechanism for achieving it, but there is limited evidence on variables that affect self-efficacy. This study aimed to identify factors influencing self-efficacy for self-management among adults on antiretroviral therapy in resource constraint settings.

Methods: A cross-sectional study was conducted among 422 adult people on antiretroviral therapy in southwest Ethiopia from March to April 2022. Face-to-face interviews were used to gather data using a structured questionnaire on the self-efficacy measure. The data were then imported into Epi Data version 4.2 and exported to SPSS version 26. Descriptive statistics, independent tests, one-way analysis of variance, Pearson correlation, and multivariate linear regression were used to analyze the data. The predictors with *p*-value of less than 0.05 were declared statistically significant.

Results: A total of 413 adults on antiretroviral therapy were interviewed with response rate of 97.9%. The total mean score of self-efficacy for self-management was 15.12 (±2.22) out of 24. Higher age, gender of the female, divorced, duration of diagnosis, and drug side effects were negatively predictors of low self-efficacy. Higher schooling, urban residence, better income, and the use of reminders positively influenced self-efficacy for self-management.

Conclusion: The study found low self-efficacy among adults on antiretroviral therapy and higher age, female gender, HIV duration, and presence of drug side effects were associated with lower self-efficacy, while higher schooling, better income, and use of reminder use were associated with higher self-efficacy for self-management. Further research is needed to determine the causal relationship between these variables and self-efficacy.

KEYWORDS

antiretroviral therapy, HIV, influencing, self-efficacy, self-management, Ethiopia

1 Introduction

According to the global HIV statistics report of 2020 worldwide, the number of persons living with Human Immunodeficiency Virus (HIV) was approximately 37.7 million; of these, 36 million were adults, which account for approximately two-thirds of the total living with HIV (FACT SHEET 2021, 2021). The HIV/AIDS pandemic has significantly impacted sub-Saharan Africa (FMOH, 2020), with Ethiopia alone housing approximately 620,000 people with HIV/AIDS (Girum et al., 2018). The advancements in HIV/AIDS treatment have transformed the experience of adult HIV patients from acute to chronic disease, encouraging self-management practices (Swendeman et al., 2009; Schulman-Green et al., 2012).

Enhancing self-efficacy is thought to be one way to improve patient self-management, which is crucial for individuals living with HIV who are receiving therapy in order to maintain their health and well-being (Areri, 2021). Self-efficacy for self-management is the capacity of an individual to plan and carry out a course of action to achieve the intended objectives (Bandura and Wessels, 1994). Increased self-efficacy improves well-being and self-management practice participation. For many chronic health disorders, including HIV, self-efficacy has a positive influence on self-management. Improving self-efficacy for self- management is crucial for enhancing quality of life, achieving optimal medication adherence, and participating in self-efficacy. By improving self-efficacy, people can improve their health behaviors and self-management. This can lead to better health outcomes and a higher quality of life (Shakya, 2018; Areri et al., 2020; Areri, 2021).

Improving individuals living with HIV on ART's self-efficacy is essential to fostering their self-belief and confidence to carry out recommended self-management practices. Research indicates that the level of self-efficacy in individuals living with HIV has been found to positively influence their overall self-management (Adefolalu et al., 2014). Better experiences with self-management and better adherence to therapy are associated with higher levels of self-efficacy (Huang et al., 2013; Allegrante et al., 2019). Additionally, research has shown that raising the self-efficacy of adults living with HIV (ALWHIV) can facilitate resource mobilization, improve symptom management, and increase their ability to tolerate discomfort (Cha et al., 2008). Thus, higher levels of self-efficacy can both improve adherence to antiretroviral therapy and lower the burden of HIV infection. Therefore, it is critical to comprehend the variables that affect a person's confidence in their ability to manage themselves in order to provide tailored help (Aregbesola and Adeoye, 2018; Adamu et al., 2020; Maay and Maryorita, 2020; Jadgal et al., 2022).

Studies have been conducted in several countries to determine the influencing factors of self-efficacy for chronic condition self-management with a similar instrument. However, the factors observed to influence self-efficacy for self-management varied across the studies. For instance, sociodemographic variables including monthly income, age, education level, job, gender, living area (Shakya, 2018; Areri, 2021), and treatment-related variables, like having adverse medication reactions (Wang et al., 2016; Areri et al., 2020) and social support (Criswell et al., 2010), were identified in previous research. In addition, other studies show that drug adherence is linked to self-efficacy, while drug-related side effects negatively impact self-management self-efficacy (Zhang et al., 2016; Okuboyejo et al., 2018). By targeting the factors that predict self-efficacy, interventions can help people improve their health behaviors and self-management.

However, there is limited evidence on factors affecting self-efficacy for adult self-management of antiretroviral therapy in developing countries, particularly in Ethiopia, whereas medical intervention and self-efficacy for self-management are scientifically recommended for controlling HIV-related complications, particularly in resource-constrained countries, such as Ethiopia. This study aimed to identify factors influencing self-efficacy for self-management among adults on antiretroviral therapy in public hospitals in south-west Ethiopia.

2 Materials and methods

2.1 Study design and area

An institutional-based cross-sectional study was conducted in three public hospitals in south-west Ethiopia, namely Mettu Karli Compressive Specialized Hospital, Jimma Medical Center, and Bedelle General Hospitals, from March to April 2022. Mettu Karli Compressive Specialized Hospital, Jimma Medical Center, and Bedelle General Hospitals provided ART services to 1,480, 2,400, and 987 adults with HIV, respectively.

2.2 Study population

All adults of ≥18 years living with HIV and enrolled in ART care in the three public hospitals were included in study population.

2.3 Inclusion and exclusion criteria

The study included adults (≥18 years) living with HIV on ART for at least 6 months. The study excluded those critically ill patients who were unable to respond and did not volunteer to sign a consent form.

2.4 Sample size determination and procedure

The sample size for this study was calculated using a single population proportion with a 95% confidence level, 5% margin of error, and 50% self-efficacy for self-management since there was no previously published research conducted in this study area, and the calculated sample size was 384. By considering the 105 of non-response rate, the final sample size was 422. This is a relatively large sample size, and it should be sufficient to detect a statistically significant difference. However, the effect size is small, and the data are relatively variable. This means that it may be difficult to detect a statistically significant difference.

The study involved a proportional allocation of a sample size to each public hospital, based on a list of adults in the ART registration

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Abbreviations: ART, antiretroviral therapy; AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus; SM, self-management; SPSS, statistical package for the social science; UNAIDS, United Nation Acquired Immune Deficiency Syndrome; USA, United States of America.

book, and computer-generated simple random sampling was used to select the participants. Invitations to participate in the study were given to participants during standard clinic visits.

2.5 Measurement

To collect participant demographic data, such as age, educational attainment, place of residence, marital status, and monthly household income, the research team created a demographic survey. Data on HIV, such as the number of years from HIV diagnosis and treatment adverse effects, was also gathered.

The study assessed self-efficacy for self-management using an HIV self-management scale to self-efficacy for SM, with participants rating their self-efficacy on eight items; each scored using a three-point Likert scale. The total mean score was calculated by obtaining the sum of all items. For this, self-efficacy for self-management range 8 to 24, with higher scores indicating better self-efficacy (Wallston et al., 2011).

The study assessed HIV-positive status disclosure through self-reports of participants who disclosed their HIV status to others, including sexual partners, family, friends, or others (Melis Berhe et al., 2020).

2.6 Data collection tool and procedure

Data were collected using a structure questionnaire through a face to face interview in a quiet room. The questionnaires assess demographic and medical factors related to HIV, including treatment duration, drug use, and side effects, and promote social facilitation through HIV disclosure and reminders. A pretest was conducted on 5% of the total sample size outside the study area at Nekemte Comprehensive Specialized Hospital to ensure that questionnaires were appropriate and necessary modifications were made. The reliability of the tool was evaluated using Cronbach's alpha, resulting in a score of 7.25.

Data were gathered by experienced nurses with orally administered survey tool from March to April 2022 at follow-up ART clinic. Data collectors underwent 1-day training on data collection procedures, and investigators regularly checked the completeness of the questionnaires.

2.7 Data processing and analysis

The collected data were checked for completeness, coded, and entered into Epi-data version 4.2 and then exported to statistical package for social science (SPSS) version 26 for statistical analysis. The study participants were characterized using descriptive analysis, which was then summarized using frequency and mean. The study utilized independent t-tests and one-way ANOVA to analyze the mean difference between self-efficacy for self-management and each independent variable. The relationship between self-efficacy for SM and each variable was identified using a Pearson correlation. Multivariate linear regression analysis was conducted to identify the factors that influence self-efficacy for self-management. Statistical significance was determined for independent variables with a p-value of less than 0.05.

2.8 Ethical approval and consent participate

The study received ethical approval from the research ethical review Committee College of Health Sciences at Mattu University and permission from Mettu Karli Compressive Specialized Hospital, Jimma Medical Center, and Bedelle General Hospitals. Participants provided written informed consent were informed about the study's purpose, right to withdraw, and privacy. The procedures followed the Helsinki Declaration, ensuring confidentiality and privacy.

3 Results

3.1 Sociodemographic characteristics of the participants

A total of 413 adult individuals on antiretroviral therapy were interviewed, with a response rate of 97.9%. The mean age of participants was 40.09 (SD ± 1,234) years. Out of 413 respondents, 222 (53.8%) were women, while 182 (44.1%) were Orthodox religion followers. The study found that 207 (50.1%) of participants were single, 133 (32.2%) were educated in primary school, and 211 (51.1%) were unemployed. Among the majority of respondents, 280 (67.8%) were urban dwellers. The mean monthly income of participants was 1652.54 Ethiopian Birr (Table 1).

3.2 Medical and social facilitation characteristics of the participants

The mean durations since being diagnosed with HIV status-positive and taking HIV treatment were $3.04\ \left(\pm 1.43\right) years$ and $26.95\left(\pm 9.37\right) months$, respectively. Over half of the participants, 274 (66.3%) used one type of HIV drug, while 315 (76.3%) did not complain about side effects. More than half of the participants, 223 (56.4%) and 253 (61.3%) did not use reminders for HIV treatments and disclosed their HIV status, respectively (Table 2).

3.3 Self-efficacy for HIV self-management of the participants and its correlate

The total score of self-efficacy for self-Management was 15.12 (SD = ±2.22) out of 24. More than half, 222 (53.8) of the respondents agreed with the statement says that "I find my efforts to change things I do not like about my HIV infection are ineffective." However, approximately 207 (50.1%) and 184 (44.6) of the participants disagreed with the statements: I am able to manage things related to my HIV infection as well as most other people and I handle myself well with respect to my HIV infection, respectively, (Table 3).

3.4 Correlation analysis of study participants

Higher age ($r = 0.221$, $p = 0.001$), being single marital status ($r = 0.111$, $p = 0.024$), educational level ($r = 0.192$, $p = 0.001$), areas of

TABLE 1 Sociodemographic characteristics of adult on ART in Public Hospitals at south-west Ethiopia, 2022 (*n* = 413).

Variables		Self-efficacy for self-management			
	Categories	*N* (%)	M ± *SD*	Test statics	*P*-value
Mean age of participants (M ± SD)		40.09±12.34			
Gender	Male	191(46.2)	15.47±2.14	2.961	0.003*
	Female	222(53.8)	14.84±2.24		
Religion	Orthodox	182(44.1)	15.45 ± 2.15	9.168	<0.001*
	Muslim	150(36.3)	14.40 ± 2.42		
	Protestant	59(14.3)	15.68 ± 1.62		
	Other, specify	22(5.3)	15.86 ± 1.32		
Marital status	Single	207(50.1)	15.01 ± 2.54	3.841	0.010*
	Married	114(27.6)	15.02 ± 1.81		
	Divorced	58(13.6)	14.96 ± 1.86		
	Widowed	36(8.7)	16.31 ± 1.55		
Educational level	Illiterate	122(29.5)	14.86 ± 2.31	7.163	<0.001*
	Primary school	133(32.2)	14.73 ± 1.66		
	Secondary school	80(19.4)	15.24 ± 2.82		
	College and above	78(18.9)	16.08 ± 1.93		
Job status	Unemployed	211(51.1)	14.92 ± 2.15	1.919	0.148
	Private employed	145(35.1)	15.28 ± 2.49		
	Government employed	57(13.8)	15.46 ± 1.54		
Living area	Rural	133(32.2)	13.98 ± 1.85	−8.125	<0.001*
	Urban	280(67.8)	15.66 ± 2.18		
Monthly average income (Ethiopian birr)		M ± SD 1652.54±1228.32			

*Statistically significance mean difference at $p < 0.05$.

TABLE 2 Medical and social facilitation characteristics of adults on ART in Public Hospitals at South West Ethiopia, 2022 (*n* = 413).

Variables		Self-efficacy for self-management			
	Categories	*N* (%)	M ± *SD*	Test statics	*P*-value
Duration of diagnosis (M ± SD)		3.04±1.43			
Duration of treatment (M ± SD)		26.95±9.37			
Number of HIV drugs used	One type	274(66.3)	15.43 ± 2.25	8.386	<0.001*
	Two types	55(13.3)	14.38 ± 1.48		
	More than two	84(20.3)	14.60 ± 2.31		
HIV drug side effects	Yes	98(23.7)	16.01 ± 1.81	5.236	<0.001*
	No	315(76.3)	14.84 ± 2.26		
Use of reminders	Yes	180(43.6)	15.50 ± 2.67	3.085	0.002*
	No	223(56.4)	14.83 ± 2.14		
HIV disclosure status	Yes	160(38.7)	14.90 ± 2.06	−1.656	0.099
	No	253(61.3)	15.26 ± 2.30		

M, mean; SD, standard deviation. *Statistically significance mean difference at $p < 0.05$.

residence ($r = 0.354$, $p = 0.001$), income ($r = 0.116$, $p = 0.018$), duration of diagnosed HIV status as positive ($r = 0.205$, $p = 0.001$), and duration since starting of HIV treatment ($r = 0.317$, $p = 0.001$) were positively correlated with self-efficacy for self-management. However, gender ($r = -0.145$, $p = 0.003$), number of HIV drug used ($r = -0.174$, p = 0.001), drug side effects ($r = -0.224$, $p = 0.001$), and use of reminders ($r = -0.15$, $p = 0.002$) were negatively correlated with self-efficacy for self-management.

TABLE 3 Respondents' scores on self-efficacy for HIV self-management in Public Hospitals at South West Ethiopia, 2022 ($n = 413$).

Questions	Response		
	Disagree	Neutral	Agree
	N (%)	*N* (%)	*N* (%)
It is difficult for me to find effective solution for problems with managing my HIV infection	78(18.4)	179(43.3)	158(38.3)
I find my efforts to change things I do not like about my HIV infection are ineffective	83(20.1)	108(26.2)	222(53.8)
I handle myself well with respect to my HIV infection	184(44.6)	62(15)	167(40.4)
I succeed in the projects I under taken to manage my HIV infection	176(42.6)	106(25.7)	131(31.7)
I am able to manage things related to my HIV infection as well as most other people	207(50.1)	42(10.2)	164(39.7)
Typically my plan for managing my HIV infection do not work out well	130(31.5)	129(30.2)	154(37.3)
No Matter how hard I try, managing my HIV infection does not turn out the way I would like	113(27.4)	178(43.1)	122(29.5)
I am generally able to accomplish my goals with respect to my HIV infection	138(33.4)	141(34.1)	134(32.4)
Mean total score of self-efficacy for self-management		**15.12 ± 2.22**	

3.5 Factors influencing self-efficacy for self-management

To identify factors influencing self-efficacy for self-management among adults on ART, candidate predictor variables on bivariate analysis (correlation and simple linear regressions) with p-value of less than 0.05 entered into multivariate linear regression. The overall model was significant with $F(11,401) = 21.566$, $p < 0.001$, $R^2 = 0.372$, Adjusted$R^2 = 0.354$. The model explains 35.4% of the variance in self-efficacy for SM.

When the variance explained by all other variables in the model was controlled, age ($\beta = -0.394$, $p < 0.001$), gender of the female ($\beta = -0.274$, $p < 0.001$), being divorced ($\beta = -0.499$, $p < 0.026$), and the presence of drug side effects ($\beta = -0.192$, $p < 0.001$) showed significant and negatively influencing self-efficacy for self-management. However, higher educational level ($\beta = 0.212$, $p < 0.001$), being urban residence ($\beta = 0.605$, $p < 0.001$), duration since diagnosed HIV as positive ($\beta = 0.499$, $p < 0.001$), and use of reminder ($\beta = 0.237$, $p < 0.001$) showed significant and positively influencing self-efficacy for self-management (Table 4).

4 Discussion

The study aimed to understand the factors influencing self-efficacy for SM among adult individuals in south-west Ethiopia, where HIV prevalence is high and healthcare access is limited. Self-efficacy is a key factor in health behavior change. People who believe that they are capable of changing their behavior are more likely to do so. The study found that adult people on antiretroviral therapy had a mean self-efficacy score of 15.12 (±2.22). The finding of this study was lower than the studies conducted in the north-west Ethiopia (Areri, 2021), Korea (Yoo et al., 2011), China (Huang et al., 2013), Indonesia (Maay and Maryorita, 2020), and United States of America (Lee, 2017). The findings of the study may differ due to variations in self-efficacy instruments, socioeconomic and demographic characteristics, health policy differences, study settings, and sample size. Moreover, health institutions should be focusing on psychosocial interventions that increase self-efficacy and can help people develop the skills and confidence they need to make healthy changes in their lives and cope with the challenges of living with HIV (Patrão et al., 2021).

The study found a positive correlation between age, education level, and self-efficacy consistent with previous research in Korea (Yoo et al., 2011). Adult HIV-positive individuals with higher education levels may possess information on living with the virus that can enhance their sense of self-efficacy for self-management by enabling them to stay informed about managing side effects and overcoming prejudice and stigma.

Our results showed that more income was linked to higher levels of self-efficacy for self-management. This outcome is in line with the findings of other previously published investigations in north-west Ethiopia (Areri et al., 2020). This is suggested that participants may have better incomes to meet their basic needs, potentially boosting their self-efficacy for SM. However, the study reveals that 51.1% of ALWHIV participants lack regular jobs, potentially contributing to low income. While short-term income modification is challenging, creating job opportunities could improve long-term income and self-efficacy for SM.

The study reveals that the use of reminders can enhance self-efficacy in self-management. These findings are consistent with those

TABLE 4 **Multivariate regression of factors influencing self-efficacy for self-management among adults on ART in Public Hospitals at south-west Ethiopia, 2022 ($n = 413$).**

Variables	*B*	SE	*B*	95%CI for *B*		*P*-value
				LL	UL	
Constant	17.124	0.949		15.258	18.989	0.001
Age(mean)	−0.071	0.011	−0.394	−0.093	−0.049	0.001*
Gender(ref. Male)	−1.218	0.271	−0.274	−1.752	−0.685	0.001*
Marital status(ref. single)	−0.266	0.119	−0.117	−0.499	−0.033	0.026
Educational level(ref. illiterate)	0.433	0.105	0.212	0.227	0.640	0.001*
Residence(ref. rural)	2.866	0.266	0.605	2.342	3.389	0.001*
Income(mean)	0.001	0.001	0.259	0.000	0.0001	0.001*
Duration of diagnosis(mean)	0.771	0.135	0.499	0.505	1.036	0.001*
Duration of treatment(mean)	−0.093	0.021	−0.393	−0.134	−0.052	0.001*
Number of drugs used	0.134	0.152	0.049	−0.164	0.433	0.378
Drug side effects (ref. Yes)	−1.000	0.246	−0.192	−1.483	−0.517	0.001*
Use of reminders (ref. yes)	1.059	0.198	0.237	−1.449	−0.670	0.001*
R^2 (Adjusted R^2) 0.372 (0.354)						
F(df) 21.566(11,401)						
$p < 0.001$						
Durbin Watson 2.16						

*Statistically significance mean difference at $p < 0.05$.

conducted in China (Wang et al., 2019). Moreover, to increase self-efficacy for self-management, a system for maximizing the use of reminders via phone calls, texts, online help, and other facilitation techniques must be developed.

In this study, duration of HIV diagnosed as positive and treatments were positively correlated with self-efficacy for self-management, which needs further studies to support the results of these findings. Our study revealed that drug side effects were negatively correlated with self-efficacy for self-management. The findings of this study were supported by a previous study in China (Huang et al., 2013). Drug side effects significantly impact HIV adults' confidence in ART, requiring care providers to assess and support patients, teaching about side effect management and enhancing self-efficacy for self-management (Zhang et al., 2016). Implementing a structured self-management model at each point of care can help HIV care providers assess side effects, discuss causes and interventions, and enhance patients' self-efficacy for health outcome management.

This study identified being rural residence positively influencing self-efficacy for self-management among adult people on antiretroviral therapy. This study's results align with previous research conducted in north-west Ethiopia (Areri et al., 2020). The findings are not found in other studies (Zhang et al., 2016) and may be specific to the Ethiopian context. Ethiopia's rural communities face low literacy, inadequate HIV treatment awareness, communication infrastructure issues, and low socioeconomic status. Limited information access and potential stigma can negatively impact self-management in rural communities, but continuous HIV education could help reduce these issues (Feyasa et al., 2022).

Overall, the results of this study point to the need for intervention to raise the self-efficacy of this population across all modifiable parameters that affect self-efficacy for self-management. Identifying and addressing issues connected to experiencing drug side effects may be made easier with the systematic and routine application of this strategy during follow-up visits. However, governments must act persistently to alter community attitudes around HIV and socioeconomic status and educational attainment.

This study has some limitations. First, due to this study was cross-sectional design, which makes it difficult to assess cause-and-effect relationships and capture longitudinal trend. In addition, we acknowledge that the power of our study is limited by the small effect size and the variable data. Second, patient self-reports and in-person interviews were used to gather the data, which could have been impacted by potential reporter bias because of social desirability. Third, although the translated instrument has been evaluated and found to be useful in other settings, its validity in the Ethiopian context has not been investigated.

5 Conclusion

This study showed that self-efficacy for self-management of adult on antiretroviral therapy was low. Ages, being female, divorced, duration of diagnosed, and experiencing drug side effects were negatively correlated with self-efficacy. Being higher educational level, urban residence, better income, duration of treatments, and the use of reminders were positively influencing self-efficacy for self-management. Moreover, health institution should focus on psychosocial interventions that increase the level of self-efficacy of people at risk of HIV because these interventions can help people to make healthy changes in their lives, cope with the challenges of living with HIV, and adhere to ART. Future longitudinal studies should investigate causal inferences and ensure the reliability of our findings.

5.1 Implications for practice

HIV care professionals should evaluate SM self-efficacy on a regular basis, offer constructive criticism, and encourage adults living with HIV to improve their SM self-efficacy. Patients should be informed about potential HIV treatment side effects and how to manage them. To improve adults living with HIV self-efficacy in SM, use intervention like self-management model during follow-up visits, increase patient belief in self-efficacy, and work on enhancing stigma and discrimination awareness particular in rural communities. Health institution should focus on psychosocial interventions that increase the level of self-efficacy of people at risk of HIV because these interventions can help people to make healthy changes in their lives, cope with the challenges of living with HIV, and adhere to ART. In order to alter community attitudes regarding HIV, poverty, and educational attainment, policymakers must take persistent action, focusing on creating awareness and enable them to earn an adequate income for adults living with HIV to improve self-efficacy.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics statement

The studies involving humans were approved by research ethical review committee of Mattu University, College of Health Sciences. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MA: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Visualization, Writing – original draft, Writing – review & editing. BG: Conceptualization, Data curation, Formal analysis, Investigation, Resources, Supervision, Visualization, Writing – original draft, Writing – review & editing. EZ: Conceptualization, Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Exploring experiences of HIV care to optimize patient-centred care in Conakry, Guinea: a qualitative study

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Introduction: Studies on the organisation of care and the power dynamic between providers and patients with HIV in sub-Saharan Africa are rare. This study aims to describe the patient-provider relationship and explore the challenges to optimal and patient-centred care for HIV patients.

Methods: This was a qualitative exploratory descriptive study using in-depth individual interviews and focus group discussions. In total, 17 individual interviews and 5 focus group discussions were conducted. This was conducted in four urban health facilities in Conakry, the capital of Guinea. Three group of participants were included in this study namely patients with HIV; health providers including facilities and services managers; and psychosocial counsellors. Psychosocial counsellors provide emotional and psychosocial support to HIV patients. Their role in the organization care in Guinea is new and they contribute to strengthening adherence of patients with HIV to ARV treatment.

Results: Patients with HIV, health providers, and psychosocial counsellors have a positive perception of the patient-provider relationship. This relationship was characterized essentially by maintaining confidentiality of HIV status disclosure, caring attitudes towards patients (being available, adjusting locations for accessing ART, based on patients' preferences), and participating in HIV patient's social life. However, scolding and miscommunication about the interpretation of viral load tests were reported. The shortage of human resources, low salaries of health staff, poor infrastructure, and the financial burden borne by patients with HIV impede the implementation of optimal patient-centred care.

Conclusion: Integrating psychosocial counsellors in HIV care organization, improving access to ARV, infrastructure, increasing human resources, and removing the financial burden for HIV patients are needed to optimal patient-centred care in Guinea.

KEYWORDS
HIV care, patient-provider relationship, qualitative research, psychosocial support, Guinea

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Abbreviations
AIDS, acquired immune deficiency syndrome; ART, antiretroviral therapy; FDG, focus group discussion; HIV, human immunodeficiency virus; IDI, in-depth individual interviews; PACTES, "les patients au cœur du traitement et des soins du VIH"; PLHIV, people living with HIV; PMTCT, prevention of mother-to-child transmission of HIV; SDG, sustainable development goal; SOLTHIS, "solidarité thérapeutique et initiatives pour la Santé"; UNAIDS, United Nations Program on HIV/AIDS; USD, United States Dollar; WHO, World Health Organization.

Introduction

Sub-Saharan Africa has the highest burden of HIV infections (80%) (1). Accessing HIV care in this region remains a major concern for achieving the 90-90-90 UNAIDS targets (2). The UNAIDS 2014 report estimated that more than 50% of people living with HIV (PLHIV) in this region did not know their status and, for those who did, only 46% had access to antiretroviral treatment (ART), with 50% of PLHIV on treatment lacking access to viral load testing (1, 2).

Despite the overall decline in HIV incidence, mortality rate, and increase in treatment accessibility, several barriers (financial, geographical and acceptability of care) still impede the access to ART in sub-Saharan Africa (2, 3). The lack of infrastructure and human resources impact also the access to HIV care in this region (1, 2). Authors have found that the high stigma, low social support, and fear of judgment and unwanted status disclosure impede access to HIV care (4, 5). Alcohol abuse (for men) and the fear of domestic violence and abandonment (for women) have been reported to limit the disclosure of patients' HIV status to their partners, as well as their access or adherence to care (4, 5). Associated non-HIV medication costs, transportation to and from health facilities have also been identified as barriers to HIV care (6). Poverty, unemployment and housing instability, and unfavourable clinic hours impede the sustained engagement of patients with HIV in care and treatment (7). Health system factors such as unfriendly provider, frequent stock-out of testing and drugs also influence the access and adherence to care of patients with HIV (8).

To overcome these challenges, there is a need to encourage HIV self-testing and to ensure there are adequate stocks of tests and drugs, affordable and acceptable health care services. Examples of these include engaging PLHIV in the design and delivery of ART services and enabling peer and lay providers to distribute ART refills and offer psychosocial support (2, 9). The development and implementation of patient-centred care might effectively contribute to enhancing HIV patients' adherence to ART, their retention in care, and their viral load suppression (10).

A positive relationship with a health provider is perceived on the patient's side as the core determinant of success in adhering to long-term treatment (11). Studies have reported that there was increased adherence of HIV patients to ART if their provider cared about them (12, 13). A 2019 systematic review reported that discrimination of PLHIV reduced their motivation in initiating or continuing ART and exposed them to risky behaviour such as sexual promiscuity (14).

Therefore, it is essential from the outset to establish a patient-provider relationship of trust and mutual respect (13). Dang et al. identified five key factors that can reduce PLHIV anxiety and build a trust at the very early stage of the patient-provider relationship: (1) reassure patients (2) tell patients it is normal to ask questions (3) show patients their laboratory test results and explain what they mean (4) avoid stigmatizing language and behaviours (5) ask patients for treatment preference (13).

Yet there is limited evidence on the organization of HIV care in sub-Saharan Africa and on how different actors within health services perceive the patient-provider relationship. A study conducted in Kenya reported that the availability of ARTs and the reduction in patients' waiting times resulted in increasing patients' retention (11). Another study from Namibia found that patients who were empowered and trained were more likely to ask questions during consultations, enjoyed interactions with their providers and had good clinical outcomes (15). In such setting, organizations formed by people living with HIV can play a considerable role in supporting and empowering (15).

In Guinea, the prevalence of HIV/AIDS is 1.5% among adults in 2018 compared to 1.7% in 2008 (16, 17). Of the 98,481 people living with HIV, only 35.6% have access to anti-retroviral therapy (ART) (18). The challenges to HIV care in Guinea include low health service utilization, the poor quality of care received and the limited access to viral load tests (only 25% of current patients used ART testing in 2015) (18). This study aimed to examine the patient-provider relationship from the perspectives of different stakeholder groups—patients with HIV, health providers and managers, and members of organizations fromed by people living with HIV (psychosocial counsellors) in this study and explore the challenges to optimal and patient-centred care for PLHIV in Conakry, Guinea. Addressing such challenges would contribute to accelerating Guinea's path towards the attainment of international health objectives of ending HIV epidemic related public health threat by 2030. This study was undertaken to describe the patient-provider relationship and explore the challenges to optimal and patient-centred care for HIV patients in the context of the PACTES project implementation in HIV care facilities in Conakry.

Study context: the justification of the PACTES project in Guinea

Guinea is located in West Africa with an estimated population of 10.5 million, living mainly in rural areas (70%) and below the poverty line (55%) (19).

The HIV epidemic is widespread in Guinea and is associated with a disparity between urban (2.7%) and rural (1.2%) settings (18). The city of Conakry remains the most affected setting (2.7%), compared to the national prevalence of 1.5% (18, 20). Moreover, nationwide, a large proportion of PLHIV (63%) do not know their status (21).

In 2016, the Ministry of Health implemented the "test all, treat all and retain all" policy (20). This is a policy which requires initiating ARTs for everybody tested HIV positive (20). Afterwards, a strategy was defined to integrate psychosocial counsellors in HIV care to facilitate the implementation of the "retain all" strategy. However, its implementation remains a challenge (20). About 80% of the funding for HIV/AIDS control activities depends on external sources (18, 19). Moreover, the shortages of skilled health workers constitute another challenge for the provision of quality healthcare services, including HIV care, in the country (22). According to the national census of

2014, Guinea accounted for nearly 9,222 skilled health workers; which corresponded to a ratio of 9 skilled health workers per 10,000 inhabitants (22). This ratio was approximately three times lower the threshold of 23 health workers per 10,000 inhabitants recommended by the world health organization in 2006 (22, 23). These health workers were also maldistributed in the country with 70% living in urban cities where 30% of the country population live (22). In the post-Ebola health system and workforce reforms, the government recruited 3,800 skilled health workers—including about 700 medical doctors, 1,000 nurses, 500 midwives, and 1,200 nurse assistants—in 2016 and deployed them in rural and remotes areas (24, 25).

A situation analysis of HIV care in Guinea conducted in 2016 (prior to the PACTES project) emphasised the low quality of HIV care including the limited coverage of the needs of patients with HIV (17, 26). Factors that underpinned this low quality of care included the inadequacy of care organisation to patients' needs, the limited access to essential viral load tests, the lack of psychosocial support to patients, and the stigmatization and poor relationship between care providers and patients, including the poor listening skills of providers (17, 26). To address the challenges and contribute to the achievement of regional and international health objectives—end HIV epidemic related public health threat by 2030—the project "Patients au Cœur du Traitement et des Soins (patients at the forefront of treatment and care); PACTES" was initiated by the NGO SOLTHIS is collaboration with the Ministry of Health and Public Hygiene of Guinea (26). This project overall aimed to enhance quality of HIV care by testing new modes of patient-centred care including ensuring access to viral load testing, reorganizing care, training and supporting psychosocial counsellors to improve relationships between health providers and patients with HIV (26). Furthermore, this PACTES project also aimed to support organizations formed by people living with HIV to creating the necessary conditions for the emergence of strong community mobilisation in favour the access to better quality care (26). More specifically, the PACTES aimed to strengthen the capacity of five health facilities involved in HIV care provision in Conakry (four) and Kankan (one) provinces (26). Among other activities planned in this study sites between 2016 and 2019, included: empowering patients' associations operating at health facility level (Psychosocial counsellors or mediators) and members of REGAP + and FEG associations (26). The Psychosocial counsellors are not part of the former health workforce involved in care provision in Guinea (17, 22). They were rather patients with HIV who were trained and financially motivated by the PACTES project (through their NGO/associations) to provide peer education to other people with HIV including their adherence to follow-up visits and ART treatment on the project study sites (17). Specifically, they provide also pre and post-screening counselling to help people accept their status, adhere to treatment and provide therapeutic education (17). They also make home visits to people who are lost to follow-up (17). There were selected based on their experience with HIV associations, and their adherence to HIV care follow-up and ART treatment (26). In total, 50 Psychosocial counsellors were identified and trained in the project (26). They were also involved in the development process of tools to gather patients' needs and expectations of HIV care (26). Furthermore, the project also targeted the training of Lab technicians across three identified laboratories in the intervention sites for viral load testing performing (26). The psychosocial support in the PACTES project therefore evolved an empowerment process of patients with HIV through their improved awareness about the right, roles and needs in the health care system (26).

Actors of the PACTES project assumed that Psychosocial counsellors' involvement in the promotion of the right of patients with HIV and the experiences sharing with their peer could improve patients' awareness about their roles, needs and expectations vis-à-vis the care circuit, and therefore empower patients with HIV in their care process. This in final would influence their approach of care and relationship with health providers.

Methods

Study design

We conducted a qualitative exploratory study (27). The study took place in Conakry, Guinea in 2018. We collected data in four public health facilities supported by a French -based non-governmental organization (NGO: SOLTHIS). These facilities stand for different levels of the health pyramid: two university hospitals, 1 primary health center and one associative health center.

Study participants

The study population was composed of three groups of participants: (1) PLHIV, (2) health providers and managers and (3) psychosocial counsellors, (Tables 1, 2).

We used purposive sampling to recruit psychosocial counsellors and health managers (27). Psychosocial counsellors facilitated the identification and access to PLHIV. The criteria for internal diversification were gender, years of experience as health providers and HIV clinical care. A convenient sampling technique was used to recruit patients with HIV. In fact, the Psychosocial counsellors were asked to contact patients with HIV and inform them about the study. Only patients with HIV who accepted to participate in the study were contacted for interviews and included in this study.

TABLE 1 Study participants' characteristics.

Study participants	Socio demographic characteristics of study participants (IDI, FGD)
HIV patients	Men (45%) Women (55%), Youth/adults (average age 41.7 years old), unemployed as well as employed persons, such as veterinary surgeons/sellers/manual workers/drivers, people with or without formal education. Average number of children of the patients (2.44).
Psychosocial counsellors	Social workers, HIV patients, members of a local NGO promoting HIV patients' rights.
Heath providers/managers	Contractors/volunteers/civil servants, health managers/physicians/laboratory technicians/nurses/pharmacists.

TABLE 2 Number of IDIs and FGDs per group of stakeholders and per site.

Study participants/ sites	1	2	3	4	Total
PLVIH patients	2 IDI	4 IDI	4 IDI	5 IDI	15 IDI
Psychosocial counsellors	1 FGD	–	–	–	1 FGD
Health providers / managers	2 IDI				2 IDI
	1 FGD	1 FGD	1 FGD	1 FDG	4 FGD
Total					**17 IDIs and 5 FGDs**

The bold values indicate the total number of individual interviews (IDIs) and focus group discussions (FGDs) conducted.

The Psychosocial counsellors were however asked to ensure a diversification of patients considering the following criteria: age, gender, employment status, and their adherence to ART treatment.

Data collection

We conducted 17 in-depth interviews (IDI) with PLHIV, health providers, and managers. We conducted 15 IDIs (all were HIV-patients) in local languages (Sousou, Malinka, and Pular) and two in French, based on participants' preferences (Table 2). The interviews were recorded for 16 participants. One participant refused to be recorded because of fear of confidentiality breach but systematic notes were taken.

We conducted interviews in private to ensure confidentiality. For two female patients, psychosocial counsellors attended the interviews at the patients' request. An appropriate location for the interview was chosen for the four participants who asked not to be interviewed in the health facilities.

Additionally, we conducted five focus group discussions (FGDs) with health providers and psychosocial counsellors (Table 2). We recorded all the FGDs, each of which was composed of six to 10 participants.

On average, each IDI and FGD was of 45 min' duration. For both data collection methods, we used pre-tested guides composed of four sections: socio-demographic characteristics, care pathway, actors' perception of HIV care and patient-provider relationships. Only a few patients were interviewed in local language; all the other participants were interviewed in French, the official language of the country.

Data analysis

We translated and transcribed all the IDIs and FDGs into French then analysed the transcripts using a thematic analysis approach (28). We used a mixed approach with deductive themes emerging from the research questions and inductive themes emerging from the empirical data (28). Software was not used to code the materials.

The diversity of data collection methods and data sources enabled us to triangulate the data and thus strengthened the internal validity of the study (29). To improve the consistency of the data and to avoid any potential bias, the principal investigator (DK) and three researchers (LB, HM and AD) conducted all individual interviews. In addition, content analysis of interviews was ensured by the two reviewers (DK and LB) using an Excel spreadsheet. Discrepancies were resolved by a team consultation that involved AD and BSC.

We shared and discussed the findings of the study with the SOLTHIS staff, then disseminated them to all the stakeholders (HIV patients, members of HIV associations, health providers and SOLTHIS project staff) during a one-day workshop. We validated the findings with the workshop participants.

Ethics approval

The study protocol was approved by the National Ethics Committee for Health Research of Guinea (number: 077/CNERS/18). All study participants provided verbal informed consent before interviews.

Patient and public involvement

Patient informed consent was obtained before conducting interviews.

Results

Role of psychosocial counsellors in HIV patients' care

The quality of the multidisciplinary management team is an important element for ensuring effective adherence and continuity of care of HIV patients. Therefore, the importance of psychosocial counsellors has been accepted by all health system actors, including health providers.

Psychosocial counsellors, some of whom are peers, i.e., PLHIV involved in HIV care, were perceived as playing a role in reducing the health providers' workload by dispensing educational therapy and psychosocial support to patients as well as filing records.

Some participants reported that psychosocial counsellors had a strong relationship with HIV patients attending health facilities. Their involvement in HIV care seemed to increase HIV patients' confidence and improve their follow-up visits in health facilities. According to participants, the main enabler of this was the potential sharing of knowledge and experience with HIV patients which helped to prepare them to confront societal stigma. Some participants argued that the involvement of psychosocial counsellors had created a community of care where everyone talked about their difficulties and asked for advice.

> *"…I was first diagnosed HIV positive during my antenatal visit… as I started taking medications and my child was born and confirmed HIV negative, I trusted the doctors' [psychosocial counsellors] advice. I often come to meet them … …. (IDI#10, HIV patient, 35-year-old woman, widow).*

> *"We have no problem disclosing our status to HIV patients. This makes them more confident and not feel alone in their condition. You know, they sometimes hesitate because they feel they are different from others. We show them our medications, pictures of our children [HIV negative] and that makes them feel comfortable… (FGD#1, psychosocial counsellors)*

A complex patient-provider relationship

Five themes emerged from the empirical data about how the patient-provider relationship in HIV care is perceived by the participants: confidentiality, caring-attitude, patients' social life, scolding and miscommunication as well as decision-making.

Confidentiality in the process of care

Health providers emphasized the importance of confidentiality as the key dimension of patient-provider relationships that HIV patients valued the most. To ensure this confidentiality, health providers mentioned that the term 'HIV' was not written on office and examination room doors and only one HIV patient was received at a time.

> *"…In the office, we make sure that the patient is not stigmatized… we do not let two patients enter the consultation room at the same time" (FGD#2, health providers).*

Nevertheless, some patients reported that they usually avoided talking about their private life during the consultation with a health provider.

> *"I do not tell them the problems of my family or my private life because you never know… you know here, people do not keep secrets" (IDI#6, HIV Patient, a 30-year-old woman, seller, divorced).*

From the patients' perspective, some said they had a 'confident' to whom they talk about their status. Others preferred not to reveal their status to anyone else because they fear confidentiality breach. Some others said they avoided attending the health facility in working hours as to avoid meeting a relative. Some would come at lunchtime or negotiate a weekend appointment while others would go to facilities located far from their homes.

> *"I'm not stigmatized because nobody knows of my illness except my wife and I'm the only one who knows about hers too" (IDI#7, a 33-year-old male patient, married)*

Caring attitude

Patients reported that they were being cared for by their health providers and were provided with enough advice on how to behave to maintain a good state of health. However, this caring attitude was strongly focused on the drugs supply.

> *"I was diagnosed in a hospital [health centre] located near [patient's residence]. Since I came here, everyone has cared for me. as I live far away from here, they can provide me with 2–3 months' of medication [ART drugs] (IDI#8, a 44-year-old female HIV patient widowed)*

Some patients appreciated that health providers were available for them and could help them with drug prescriptions.

> *"The physicians here are fully available to us… any time you call them [over the phone], they are available to assist you… whenever I am sick, I call my physician and tell him that I want to take this or that product … " (IDI#16, 46-year-old male HIV patient, married).*

From the health provider's perspective, they feel the need to develop and maintain caring attitudes towards their patients. They stated that asking questions on what the patient did yesterday, their hobbies and food preferences could make the patient feel cared for. Furthermore, others reported that welcoming the patient warmly and comparing HIV to diabetes, or hypertension improved the patient-provider relationship.

> *" Everything depends on the way you welcome your patient … you have to ask what he does during his day, what he likes eating, did he go to a night club and what happened then… He [the patient] must be diverted from what he is suffering from." (IDI#16, male health provider)*

Patients' social life

Health providers reported that they contribute to improving the patients' social life by assisting them in finding a partner.

> *"There are patients who come to tell us that a friend (an HIV patient) wants to get married and is looking for a woman or a man to get in touch with. We manage to create families like that. And their care becomes very easy." (FGD#4, health providers).*

Paternalistic behaviour

Psychosocial counsellors and health providers reported that providers sometimes scolded at patients. However, they felt this could not be considered as misconduct but a way to make patients respect the care process.

> *"The doctor shouts out because he [the patient] does not respect their appointments. This is for their well-being, not to harm the patient" (FGD#1 psychosocial counsellors).*

> *"We have a responsibility to tell them what will happen if they don't follow our advice…. You have some patients who do not perform their tests at the scheduled period or who forget to take their medications sometimes. With such patients, you have to shout at them and make them obey the procedures … some patients are like that…" (IDI#17, health provider).*

They also indicated poor communication between providers and patients, especially for laboratory results or viral load testing.

> *"Saying to a patient that the results are good; what does good mean?" (FGD#1, psychosocial counsellors).*

Some patients also mentioned that they were not aware about their viral load status although they had performed the test. This was reported to lead to miscommunication between patients and providers as some patients, according to participants, may not be aware of the implications of their treatment and the requirement to adhere to it.

HIV patients' decision-making

HIV patients reported engaging in communication with their health providers, sharing their concerns and difficulties with them. Some emphasized that they could ask their providers to prescribe drugs according to their preferences. Others mentioned their ability to choose the health facility and the time they preferred for a medical visit.

Some health providers felt that respecting the patients' choice of HIV care facilities was an appropriate way to retain them and get them to adhere to treatment.

> *"He listens to me, advises me and encourages me … he prescribed me vitamins so I can eat and sleep well and gained weight before I go back to work" (IDI#7, 33- year-old male HIV patient, married)*

Challenges to optimal and patient-centred care

Lack of human resources and motivation

At the health facility level, the shortage of human resources (both medical and psychosocial staff) was raised as an obstacle to implementing patient-centred care.

> *"We only have two doctors here to look after all the patients", (FGD#2, health providers).*

The main concern raised by providers was their insecure status. Most of them were not civil servants and thus not paid regularly. This was seen as a demotivating factor that could influence the quality of a patient-provider relationship.

Poor infrastructure

Health providers and managers also mentioned the poor infrastructure that resulted in breaches in confidentiality as well as a lack of privacy during examinations.

> *"We are four doctors consulting in this office here… We only have one office for both reception and counselling of patients. Our working conditions are really difficult here "(FGD#2, health providers).*

Lack of drugs

During the data collection (July 2018), there was a serious ART stock-out following the ARV stockpile fire at Guinea's central pharmacy in June 2017. As a result, ARVs were being dispensed according to their availability, forcing patients to call or travel several times to the facilities to obtain drugs.

> *"I came here and was told that there is no drug… I said how can we manage this because I live in Timi [fictitious name of a city located 50 km from Conakry]" (IDI#11, 29-year-old male HIV patient, single).*

Financial burden for HIV patients

Although ARTs are dispensed free of charge, patients continued to pay for several services that can be very expensive, such as laboratory tests.

> *"I paid 40,000 GNF [local currency, equivalent to 4USD] for transport as I live at Timi. I gave 300,000 GNF [30USD] to the Lab man and 20,000 GNF [2USD] to the Doctor who is taking care of me… I sold my phone for 100,000 GNF [10USD] and my shoes for 30,000 GNF [3 USD] (IDI#12 25-year-old male HIV patient, single, unemployed mechanic).*

Furthermore, the cost of drugs to treat other diseases such as anaemia, diabetes or opportunistic diseases such as candidiasis or dermatitis is an additional financial burden for HIV patients:

> *"HIV treatment is free but not the lab tests such as haemoglobin rate and glycaemia, nor the treatment of opportunist diseases. So, if a patient suffers from another disease, he has to pay for medications and related lab tests…" (FGD#2, health providers).*

Patients also reported paying high transportation costs.

> *"I usually come by motorcycle which costs 25 000 GNF (about 3 USD)"(IDI#12, a 34-year-old female HIV patient, unemployed, married).*

Many participants reported that they preferred to use facilities a long distance from their place of residence to maintain the confidentiality of their status, even though it involved high transportation costs.

> *"We have some patients who are registered in two or three different facilities. They can go to one facility for 3–6 months then change it to another… some even travel from one district to another to get their medications [ART drugs] (FGD#2, health providers).*

Discussion

This qualitative study provides an in-depth understanding of the organization of health care services and the patient-provider relationship in HIV care in Conakry, Guinea. Our findings show a less patriarchal patient-provider relationship, with a progressive engagement in their medical care on the part of HIV-patients'. Our study identified the role played by health providers in reconstructing patients' social life and reorganizing the care pathway, taking in account the role of psychosocial counsellors. Study participants cited the financial burden associated with HIV care as an important hindrance, impeding patients' adherence to care and reducing optimal patient-centred care.

A patient-provider relationship focused on dispensing drugs

Studies in sub-Saharan Africa showed that HIV patients do not play an active role in their medical care. of the reasons include their low educational level, their experience of anxiety and fear of confidentiality breach or for being perceived as a difficult patient (13, 15, 30). In contrast, our findings identified changing behaviours and roles of both actors for building a confident relationship. HIV patients reported sharing their social and health concerns with health providers, communicating their drug prescriptions, and sometimes altering them according to their preferences. They also reported negotiating with health providers about their follow-up visits outside peak times and in their health facilities of choice.

On the health providers' side, they reported using a variety of strategies to improve patients' engagement in their care. As such, they reported building a caring and confident relationship with patients and reducing patients' psychological burden by assimilating HIV to other diseases. However, our study identified drug provision and biomedical tests as essential components of the patient-provider relationship. From the patients' perspective, the availability of ART was the central element in the improvement of their health. A reason might be the fact that HIV-patients in our study have good access to information on the efficacy of ART in improving their health and the consequences in interrupting ARTs. Ahmed S et al. found that HIV patients' misconceptions of ARTs' impact on their mortality and their preference for traditional medicine were among the factors that hinder their confidence and willingness to pursue ARTs (31). The reporting of ARTs stock outs in Guinea because of the ARV stockpile fire at Guinea's central pharmacy (on June 17th, 2017) might have led to HIV patients' perception of uncertainty and greater risk, thus changing their attitude to ART drug intake.

Financial burden borne by patients

Although ARTs are provided at no costs in Guinean public health facilities, our results showed that HIV patients are still exposed to financial hardship due to additional healthcare expenditures such as transportation, biomedical exams, costs of opportunistic diseases, and informal payments often made as a gift to health providers. In our study, some patients borrowed money from their relatives or sold their assets such as shoes and mobile phones to cover their care costs. These findings are not specific to Guinea in sub-Saharan African region. Studies in Nigeria and South Africa have reported an increase in HIV patients' spending on accommodation, special foods and medicines purchased on the days when they visit health facilities (32, 33). Moreover, because of the time spent in health care facilities, HIV patients may incur a loss of income or salary (33). In chronic conditions such as HIV, these costs push thousands of patients into extreme poverty and food insecurity which lead them to stop ARTs (34, 35). There is evidence that bringing HIV care services closer to populations that need them is crucial for achieving global on-going strategies (1). Conversely, our study revealed that HIV patients prefer attending health facilities located far from their residence because of the fear of confidentiality breach.

The role of psychosocial counsellors

Our study shows the important role that psychosocial counsellors play in relieving health providers of psychosocial support. Furthermore, health managers reported greater patient adherence to health services than before the involvement of psychosocial counsellors in their facilities. Other studies in Kenya and Uganda confirmed these findings and emphasized the positive effects of psychosocial support in optimizing patients' adherence to care and ARTs (36, 37). A recent literature review in sub-Saharan Africa has also reported that non-professional health workers living with HIV increased the likelihood of HIV patients to adhere to care and ARTs (37). One possible explanation for these findings might be that non-professional health workers spend more time with PLHIV and this enables them to provide excellent education on HIV and medication use (38). In addition, they have the ability to provide social and emotional support to HIV patients (37), especially when they are patients themselves, engaged as peers and sharing their own experience of life and care.

Practical implications

Our study points to strategies that can be implemented with minimal costs or change to care organization. Firstly, given the importance of a strong mutual trust between patient and provider in ensuring an effective and completed HIV care, it is crucial for providers to restrict access to consultation rooms during HIV patients' visits, as reported in this study.

Psychosocial counsellors have been identified as key actors in reinforcing and maintaining a confidential relationship with HIV patients and with the provision of psychological support. For Guinea to achieve holistic (social, psychological and physical) care for HIV patients, it is crucial to develop an organizational model of care, which aims to strengthen the role of psychosocial counsellors and to introduce task-shifting between health providers and non-health providers, especially in the case of psychosocial counselling and to consider engaging PLHIV in peer-support.

The essential element of patients' engagement in care focused on drug provision and the biomedical tests performed. These findings suggest the need to change the mind-set of health providers and patients for the implementation of an effective patient-centred approach in HIV care in Guinea.

Strengths and limitations of the study

To our knowledge, this is one of the first qualitative studies in Francophone West Africa to conduct an in-depth exploration of the organization and patient-provider's relationship in the context of HIV care. Furthermore, the implementation and reporting of this study also adhered to the internationally recognized Consolidated criteria for reporting qualitative research (COREQ) guidelines (39). However, the study reveals some methodological limitations. We conducted this study in health facilities based in the capital, Conakry. Therefore, the findings may not be representative of the national situation and rural settings. There was a limited number of focus group discussions with psychosocial counsellors. There was a national strike because of fuel price rising which harmed public transportation and thus access of psychosocial counsellors to health facilities. Another limitation was the social desirability bias as our study sites were supported by an international NGO. The strategy used by the research team to limit this bias was to specify our external role, independent from the NGO. The activities of the project were implemented before this study had started.

Conclusion

This qualitative study provides an in-depth understanding of the organization of health care services, the experience of care for the patients and providers, and the patient-provider relationship in HIV care in Conakry, Guinea. Our findings show a less patriarchal provider-patient relationship with a progressive engagement of HIV patients in their medical care, the importance of reorganizing care pathways, taking in account the role of psychosocial counsellors. There is a need to support the integration of psychosocial counsellor in HIV care provision, as to sustain the benefits of the PACTES project in Guinea.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Comité National d'Ethiques pour la Recherche en Santé de Guinée (CNERS). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

All co-authors fulfill all three of the ICMJE guidelines for authorship. DK and AD designed the study and received feedback from EG, TB, HM. DK, AD and, HM were involved in data acquisition, analysis and interpretation and revising it critically for important intellectual content. DK drafted the manuscript with inputs from AD, AS, EG, HM, BSC, TB and MH. DK and AS amended the article following the peer-review process by the journal. All the authors have given final approval for this version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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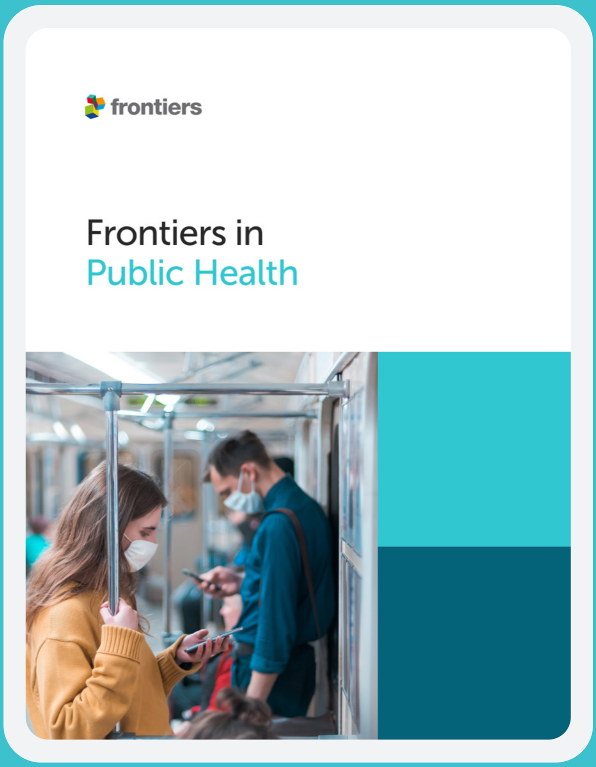

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