

Effect of Psychological Intervention on Depression in Newly Diagnosed HIV/AIDS Patients and Its Relationship with CD4+ T Cell Count: Post-print

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Abstract

Background: HIV/AIDS is associated with depression, which increases the risk of HIV-associated neurocognitive disorder (HAND) and reduces patient adherence to antiretroviral therapy (ART), thereby exacerbating HIV transmission risk. Domestic studies have rarely reported on the effectiveness of psychological interventions for depression in newly diagnosed people living with HIV/AIDS (PLWHA) and their correlation with CD4 + T cells. Objective: To investigate the effectiveness of psychological intervention for depression in newly diagnosed PLWHA and its correlation with CD4 + T cell count, providing a reference for HIV clinical diagnosis and treatment. Methods: From April 2020 to June 2022, newly diagnosed PLWHA patients with depression were selected from designated ART hospitals in Jiangxi Province using convenience sampling. Patients initiated ART and psychological interventions immediately after diagnosis, with a total intervention period of 12 weeks. The Hamilton Depression Rating Scale (HAMD) and Hamilton Anxiety Rating Scale (HAMA) were administered before and after intervention, and CD4 + T cell counts were measured for analysis. Results: A total of 200 newly diagnosed PLWHA patients with depression were enrolled, with 178 effectively followed up (effective rate: 89.0%). Among the 178 PLWHA patients with depression, 88 cases (49.4%) had mild-to-moderate depression and 90 cases (50.6%) had severe depression, with 173 cases (97.19%) accompanied by anxiety. The mean CD4 + T cell count was $(346.39 \pm 156.87) \text{ cells}/\mu\text{L}$ before intervention and $(421.93 \pm 149.61) \text{ cells}/\mu\text{L}$ after intervention. After intervention, T cell count in newly diagnosed PLWHA patients with depression was significantly higher than before intervention ($10.971, P < 0.05$), while total scores and factor scores of HAMD and HAMA were all lower than before intervention ($P < 0.05$). Before intervention, total HAMD score was negatively correlated with CD4+ T cell count grading (using 500 cells/ μL as cutoff) ($r_s = -0.157, P = 0.036$) and positively correlated with total HAMA score ($r_s = 0.764, P = 0.001$). After intervention, total HAMD score was negatively correlated with post-

intervention CD4+T cell count ($rs = -0.150, P = 0.046$) and strongly positively correlated with total HAMA score (0.939, $P < 0.001$). Newly diagnosed PLWHA patients with depression with CD4 + T cell count < 500 cells/L had higher total HAMD and HAMA scores than those with CD4 + T cell count ≥ 500 cells/L ($P < 0.05$). Conclusion: The severity of depression in newly diagnosed PLWHA is correlated with CD4 + T cell count and can be significantly improved through professional psychological intervention.

Full Text

Study on Effectiveness of Psychological Intervention for Depression in Newly Diagnosed HIV/AIDS Patients and Its Relationship with CD4+ T Cell Counts

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Abstract

Background: HIV/AIDS is associated with depression, which increases the risk of HIV-associated neurocognitive disorders (HAND) and reduces patient compliance with antiretroviral therapy (ART), thereby exacerbating HIV transmission risk. Few domestic studies have reported on the effectiveness of psychological interventions for depression in newly diagnosed people living with HIV/AIDS (PLWHA) and their correlation with CD4+ T cell counts.

Objective: To explore the effectiveness of psychological intervention for depression in newly diagnosed PLWHA and its correlation with CD4+ T cell counts, providing a reference for HIV clinical diagnosis and treatment.

Methods: From April 2020 to June 2022, a convenience sampling method was used to select newly diagnosed PLWHA with depression from ART-designated hospitals in Jiangxi Province. Participants initiated ART and psychological intervention immediately upon diagnosis, with a total intervention period of 12 weeks. The Hamilton Depression Rating Scale (HAMD) and Hamilton Anxiety Rating Scale (HAMA) were administered before and after intervention, and CD4+ T cell counts were analyzed.

Results: A total of 200 newly diagnosed PLWHA with depression were included, with 178 cases effectively followed up (89.0% retention rate). Among the 178 participants, 88 cases (49.4%) had mild to moderate depression and 90 cases (50.6%) had severe depression; 173 cases (97.19%) were accompanied by anxiety. The mean CD4+ T cell count was (346.39 ± 156.87) cells/ μ L before intervention and (421.93 ± 149.61) cells/ μ L after intervention. Post-intervention CD4+ T cell counts were significantly higher than pre-intervention levels ($t = 10.971, P < 0.05$), while HAM D and HAM A total scores and all factors scores were significantly lower ($P < 0.05$). Pre-intervention HAM D total scores were negatively correlated with CD4+ T cell count grades (using 500 cells/ μ L as cutoff) ($r_s = -0.157, P = 0.036$) and positively correlated with HAM A total scores ($r_s = 0.764, P = 0.001$). Post-intervention HAM D total scores were negatively correlated with post-intervention CD4+ T cell counts ($r_s = -0.150, P = 0.046$) and strongly positively correlated with HAM A total scores ($r_s = 0.939, P = 0.001$). Patients with CD4+ T cell counts < 500 cells/L had significantly higher HAM D and HAMA total scores than those with counts ≥ 500 cells/L ($P < 0.05$).

Conclusion: The severity of depression in newly diagnosed PLWHA is associated with CD4+ T cell counts and can be significantly improved through professional psychological intervention.

Keywords: Acquired immunodeficiency syndrome; HIV infections; CD4+ T cell; Depression; Anxiety

Introduction

AIDS is a chronic, fatal infectious disease caused by HIV that seriously threatens human life and safety. Although antiretroviral therapy (ART) can prolong the lifespan of people living with HIV/AIDS (PLWHA), HIV-associated neurocognitive disorders (HAND), adverse drug reactions, and psychosocial problems stemming from discrimination still severely affect their quality of life. HIV/AIDS and mental illness have a bidirectional relationship, with depression being the most common and impactful condition. Depression may be an independent risk factor for cardiovascular disease in PLWHA and increases the risk of HAND, while also affecting ART adherence and exacerbating HIV transmission risk. CD4+ T cells serve as crucial immune cells in the body, and CD4+ T cell count is one of the important clinical indicators for judging ART efficacy and immune reconstitution. Counts below 500 cells/L are generally considered indicative of impaired immune function, while counts below 200 cells/L indicate severely impaired immune function (immunodeficiency). Currently, few studies both domestically and internationally have focused on the relationship between depression and CD4+ T cell counts in newly diagnosed PLWHA. This study explores the effectiveness of psychological intervention for depression in newly diagnosed PLWHA and its correlation with CD4+ T cell counts, providing a scientific basis for HIV prevention and control.

Methods

1.1 Study Participants From April 2020 to June 2022, we used convenience sampling to recruit 200 newly diagnosed PLWHA with depression from ART-designated hospitals in Jiangxi Province for psychological assessment, intervention, and CD4+ T cell count testing.

Inclusion criteria: Clear consciousness; age 18-70 years; education level of primary school or above; depressive symptoms meeting the diagnostic criteria for “F32 Depressive Episode” in the International Classification of Diseases (ICD)-10 as assessed by attending psychiatrists or above; no prior exposure to antidepressant or anti-anxiety interventions; informed consent for psychological assessment and non-pharmacological psychological intervention.

Exclusion criteria: Previously diagnosed HIV infection; recent history of substance abuse (alcohol or drugs, etc.); history of loss of consciousness >30 minutes; other neurological diseases or severe mental disorders unrelated to HIV infection.

Withdrawal criteria: Patients who required antidepressant medication or hospitalization during the intervention were withdrawn and promptly referred to psychiatric treatment.

This study complied with the ethical standards of the Social Organization Participation in AIDS Prevention and Treatment Fund Project (ethics approval number: IIT2021055).

1.2 Measures 1.2.1 Data Collection: Data collected included gender, age, marital status, education level, place of residence, ethnicity, and CD4+ T cell counts.

The Hamilton Depression Rating Scale (HAMD) and Hamilton Anxiety Rating Scale (HAMA) were administered. The HAMA consists of 14 items and two factors (somatic anxiety and psychic anxiety), with total scores >29 indicating possible severe anxiety, >21 indicating definite significant anxiety, >14 indicating definite anxiety, and scores above 14 suggesting clinically meaningful anxiety symptoms. The HAMD comprises 24 items and seven factors (anxiety/somatization, weight, cognitive disturbance, diurnal variation, retardation, sleep disturbance, and hopelessness), with total scores >35 indicating possible severe depression and >20 indicating possible mild to moderate depression.

Two attending psychiatrists from the clinical psychosomatic department independently rated each patient after psychiatric examination. If the scores from the two scales showed no significant difference, the average was taken as the final score; if the scores differed significantly, a chief physician conducted another evaluation, and that score was used as the final score. For each scale, factor scores were calculated as the arithmetic sum of items within each factor divided by the number of items in that factor structure, while total scores were the sum of all items. Higher scores indicated more severe depression or anxiety,

with the assessment period covering the most recent two weeks. Evaluations were conducted once before intervention and once at week 12 after enrollment.

1.3 Psychological Intervention Basic psychotherapy techniques included listening, questioning, encouragement, content reflection, emotional reflection, confrontation, interpretation, guidance, and non-verbal skills. First, psychotherapists or psychiatrists established good therapeutic relationships with newly diagnosed PLWHA using supportive psychotherapy techniques such as listening, encouragement, explanation, and guidance. Then, based on the personality characteristics of each patient, psychiatrists selected individual therapy approaches including supportive psychotherapy, cognitive behavioral therapy, and mindfulness acceptance commitment therapy at 1-2 sessions per week, approximately 40 minutes per session, for 4-6 consecutive weeks; systematic desensitization therapy once daily, 20-30 minutes per session, for 6-8 sessions; flooding therapy for those lacking protective awareness, once daily or every other day, for 2-4 sessions; and aversion therapy for 4 consecutive weeks, 2-3 sessions per week. The treatment process focused on single, specific target behaviors whenever possible. When target behaviors resulted from multiple factors, two or more therapies were considered simultaneously. The total intervention period was 12 weeks.

1.4 ART and CD4+ T Cell Count Detection Newly diagnosed PLWHA initiated ART immediately upon diagnosis. Concurrent with psychological assessments before intervention and at week 12 after enrollment, venous blood was drawn and placed in EDTA-K3 anticoagulant tubes (5 mL each, two tubes). The anticoagulant tubes were inverted 6-8 times to ensure thorough mixing of blood with anticoagulant, and CD4+ T cell count testing was completed within 24 hours.

1.5 Statistical Methods After verification, raw data were imported into an SPSS19 database for organization and statistical analysis. Significance testing used two-tailed probabilities with $\alpha=0.05$. Count data were expressed as frequencies and percentages. Measurement data were expressed as $\bar{x}\pm s$ or $M(P25,P75)$. For normally distributed data, between-group comparisons used t-tests, while pre-post intervention comparisons used paired t-tests; otherwise, Mann-Whitney U rank-sum test and paired-sample Wilcoxon signed-rank test were used respectively. Correlation analysis was expressed using Pearson or Spearman correlation coefficients. Individual interview data and test results were analyzed together.

Results

2.1 General Characteristics A total of 200 newly diagnosed PLWHA with depression were included, with 178 cases effectively followed up, yielding a retention rate of 89.0%. Among the 178 PLWHA with depression, 88 cases (49.4%) had mild to moderate depression and 90 cases (50.6%) had severe depression;

173 cases (97.19%) were accompanied by anxiety. The age range was 18-70 years, with a mean age of (39.5 ± 14.8) years. Additional baseline data are shown in Table 1. Among participants, 82.6% had impaired immune function (CD4+ T cell count <500 cells/ L), including 14.6% with immunodeficiency (CD4+ T cell count <200 cells/ L) before intervention.

2.2 Analysis of HAMD and HAMA Total and Factor Scores Post-intervention HAMD and HAMA total scores and all factor scores were significantly lower than pre-intervention scores ($P < 0.05$), as shown in Table 2.

2.3 Analysis of HAMD, HAMA Total Scores and CD4+ T Cell Counts Before intervention, HAMD total scores were negatively correlated with CD4+ T cell count grades (using 500 cells/ L as cutoff) ($r = -0.157$, $P = 0.036$) and positively correlated with HAMA total scores ($r = 0.764$, $P = 0.001$). After intervention, HAMD total scores were negatively correlated with post-intervention CD4+ T cell counts ($r = -0.150$, $P = 0.046$) and strongly positively correlated with HAMA total scores ($r = 0.939$, $P = 0.001$).

Newly diagnosed PLWHA with depression who had CD4+ T cell counts <500 cells/ L showed significantly higher HAMD and HAMA total scores than those with counts ≥ 500 cells/ L ($P < 0.05$), as presented in Table 3.

Discussion

Depression is the most common mental disorder among PLWHA, with extremely high prevalence rates, particularly among newly diagnosed individuals. In some regions of Tanzania, the prevalence of depression among PLWHA reaches 58%, with moderate to severe depression exceeding 41%. This study also found that newly diagnosed PLWHA with depression frequently have comorbid anxiety, with the detection rate of moderate to severe depression exceeding 50%—indicating that newly diagnosed PLWHA are prone to comorbid severe depression, consistent with international findings. Depression severely impairs social functioning and reduces quality of life in PLWHA, representing an important factor contributing to poor ART adherence and self-harm or suicide. Currently, depression in PLWHA remains largely underdiagnosed and undertreated, increasing the difficulty of HIV prevention and control and urgently requiring professional, effective intervention.

Research suggests that concurrent antidepressant treatment with ART is necessary, recommending referral of PLWHA to mental health services for timely intervention. Implementing mental health screening and intervention measures at the first visit following a positive test result is particularly crucial, and overall intervention strategies should be adjusted according to the needs of patients at highest risk for depression. Clinical psychotherapy is commonly used for mild to moderate depression or as adjunctive treatment after effective symptom improvement with medication for severe depression. In this study, newly diagnosed PLWHA with depression showed significant improvement in depressive

symptoms after professional psychological intervention, indicating that professional psychological intervention is effective for newly diagnosed PLWHA with depression and can promote ART adherence, warranting broader implementation.

Immune function is closely related to mental status. CD4+ T cell count serves as an important indicator for measuring immune function and evaluating ART efficacy and immune reconstitution, with counts <500 cells/ L indicating impaired immune function and <200 cells/ L indicating severely impaired immune function (immunodeficiency). In this study, newly diagnosed PLWHA with depression generally exhibited impaired immune function (82.6%), with immunodeficiency accounting for 14.6%—similar to international findings. Depressive symptoms in PLWHA are negatively correlated with CD4+ T cell counts, becoming more pronounced when immunodeficient (CD4+ T cell count <200 cells/ L). This study also found that pre-intervention depression severity correlated with the degree of immune impairment, while post-intervention depressive symptoms showed negative correlation with CD4+ T cell values. The underlying mechanisms may be multifaceted.

First, HIV infection may cause HAND from the initial stage. When immune function is impaired, patients are prone to physical discomfort and social functioning limitations, and when immunodeficient, they are susceptible to opportunistic infections and tumors that worsen depressive symptoms—particularly when newly diagnosed PLWHA already have comorbid severe depression. As ART leads to immune reconstitution and physical symptom improvement, psychological intervention can significantly ameliorate mild to moderate depression, partially restore social functioning and cognition, and promote changes in high-risk behaviors, creating a virtuous cycle. Second, before ART and psychological intervention, the dual damaging effects of HIV and depression may have a synergistic impact far exceeding either alone, with HIV's damage to CD4+ T cells being primary and potentially masking depression's effects. Third, the relatively short intervention period and high proportion of severe depression in this study may have limited the effectiveness of psychotherapy alone; additionally, the inclusion of some drug-resistant patients may have influenced results. In short, low CD4+ T cell counts are predictors of untreated depression in PLWHA, though whether a causal relationship exists between PLWHA depression and CD4+ T cell counts remains unclear and requires further investigation.

In summary, the health status of PLWHA is severely affected by both psychological factors and HIV. Newly diagnosed PLWHA with depression often have comorbid anxiety, and their depression severity correlates with the degree of immune impairment. After ART, CD4+ T cells increase, while psychological intervention improves depression severity, with post-intervention depressive symptoms showing negative correlation with CD4+ T cell values. Sustained and effective professional psychological intervention helps improve ART adherence and reduce high-risk sexual behaviors, thereby decreasing HIV transmission risk and curbing the HIV epidemic. Relevant administrative departments should

strengthen training for HIV clinicians to enhance their ability to recognize mental disorders and refer patients for specialized psychiatric treatment.

Author Contributions

LIU Yun was responsible for study design and manuscript writing; LU Heli and ZOU Qing were responsible for study implementation, data collection, and organization; YUAN Yefeng was responsible for management and coordination of study execution; LIU Yun took overall responsibility for the article and supervised the project.

Conflict of Interest

The authors declare no conflict of interest.

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