



Depression and Its Correlates among People Living with Human Immunodeficiency
Virus at St. Paul's Hospital Millennium Medical College, Addis Ababa, 2026

By

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List of Acronyms

- **AIDS:** Acquired Immunodeficiency Syndrome
- **AOR:** Adjusted Odds Ratio
- **ART:** Antiretroviral Therapy
- **Brief COPE:** Brief Coping Orientation to Problems Experienced Inventory
- **CES-D:** Center for Epidemiologic Studies Depression Scale
- **CI:** Confidence Interval
- **DS:** Depressive Symptoms
- **HIV:** Human Immunodeficiency Virus
- **IRB:** Institutional Review Board
- **MD:** Medical Doctor
- **MPH:** Master of Public Health
- **OR:** Odds Ratio
- **OSSS-3:** Oslo Social Support Scale (3-item)
- **PHQ-9:** Patient Health Questionnaire-9
- **PLWH:** People Living with HIV
- **SPHMMC:** St. Paul's Hospital Millennium Medical College
- **SPSS:** Statistical Package for the Social Sciences
- **WHO:** World Health Organization

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Abstract

Background: Depressive symptoms (DS) are common among people living with HIV (PLWH) and are associated with poor adherence to antiretroviral therapy, reduced quality of life, and increased morbidity. In Ethiopia, prevalence estimates range from 36% to 39%. Although some studies have examined depression in other populations at St. Paul's Hospital Millennium Medical College (SPHMMC), no recent hospital-based study assessed the prevalence and correlates of DS among PLWH attending ART services at this major urban referral center. Without this evidence, clinicians lack the data needed to identify high-risk patients, hindering targeted interventions and potentially perpetuating poor ART adherence and adverse health outcomes.

Objective: This study assessed the prevalence of depressive symptoms and associated factors among PLWH at the ART clinic of SPHMMC.

Methods: A facility-based cross-sectional study was conducted among 408 adults living with HIV attending the ART clinic at SPHMMC from 19 September to 21 November 2025. Participants were selected using consecutive sampling. Depressive symptoms were measured using the validated Amharic PHQ-9 (score ≥ 10 indicating clinically significant symptoms). Psychosocial factors were assessed with the Oslo Social Support Scale (OSSS-3) and a locally adapted HIV-related stigma questionnaire. Clinical data, including CD4 count, WHO stage, and ART regimen, were extracted from medical records. Binary logistic regression identified factors associated with depressive symptoms ($p < 0.05$). Ethical clearance was obtained from the SPHMMC Institutional Review Board.

Results: Among the 408 participants, 59.1% had clinically significant depressive symptoms (PHQ-9 ≥ 10). Poor social support was the strongest predictor, with participants in Oslo category 1 having nearly nine times higher odds (AOR = 8.97, 95% CI: 1.72–46.79, $p = 0.009$) and those in category 2 having over eleven times higher odds (AOR = 11.17, 95% CI: 2.09–59.75, $p = 0.005$) compared to those with strong support. Higher HIV-related stigma doubled the odds of depression (AOR = 1.99, 95% CI: 1.23–3.22, $p = 0.005$), and tobacco use was also significantly associated (AOR =

3.39, 95% CI: 1.08–10.61, $p = 0.036$). Demographic and clinical variables, including age, education, residence, WHO stage, and comorbidities, were not significantly associated.

Conclusion: This high prevalence underscores the urgent need to integrate routine mental health screening into HIV care at urban referral centers in Ethiopia.

Keywords: Depressive Symptoms, HIV, Prevalence, Correlates, Cross-Sectional Study, Ethiopia

1. Introduction

1.1 Background

Depressive symptoms (DS) affect up to 40% of people living with HIV (PLWH) globally, contributing to poor adherence to antiretroviral therapy (ART), increased morbidity, and impaired social and occupational functioning [1–3]. Women, younger adults, and socially disadvantaged groups are disproportionately affected. The COVID-19 pandemic has further exacerbated mental health challenges in this population through increased social isolation, stress, and barriers to care [4,5].

Biological mechanisms linking HIV to DS include immune dysregulation, neuroinflammation, and ART-related neuropsychiatric effects on the central nervous system [6–8]. Psychosocial stressors such as stigma, discrimination, poverty, unemployment, social isolation, and food insecurity also heighten vulnerability to depressive symptoms. The relationship between HIV and DS is bidirectional: HIV-related biological and psychosocial factors can precipitate depression, while DS can negatively impact ART adherence, increase risky behaviors, and worsen immune function [6,8,9].

In Ethiopia, hospital- and community-based studies conducted between 2018 and 2022 report DS prevalence among PLWH ranging from 36% to 39%, primarily measured using the PHQ-9 [12–14]. Urban populations, particularly in Addis Ababa, face additional stressors, including overcrowding, unemployment, and social pressures, which may further elevate the risk of depressive symptoms. Despite the high burden, mental health services remain poorly integrated into HIV care due to limited resources, stigma, and a shortage of trained professionals, leaving many PLWH undiagnosed and untreated [13,15].

St. Paul's Hospital Millennium Medical College (SPHMMC) is a major urban ART referral center serving a large, diverse population of PLWH in Addis Ababa. Although studies have assessed depression among other groups at SPHMMC, such as healthcare workers and patients with chronic illnesses, no recent hospital-based

research has examined the prevalence of DS and its socio-demographic, clinical, and psychosocial correlates among PLWH attending ART services. Updated, context-specific data are therefore needed to guide targeted screening and support the integration of mental health interventions into HIV care at this facility.

Addressing this evidence gap will allow identification of high-risk subgroups, such as women and socially vulnerable patients, and provide a foundation for future research on psychosocial interventions in urban HIV care settings.

1.2 Statement of the Problem

Depressive symptoms (DS) are a major yet often under-recognized health issue among people living with HIV (PLWH). Globally, approximately 20%–40% of PLWH experience clinically significant depressive symptoms, which is substantially higher than the prevalence in the general population [1–3]. In PLWH, depressive symptoms contribute to poor adherence to antiretroviral therapy (ART), increased treatment failure, faster HIV disease progression, and higher mortality [4–6].

In Ethiopia, studies conducted between 2018 and 2022 report that 36%–39% of PLWH experience depressive symptoms [9–11]. Contributing factors include stigma, poverty, social isolation, and advanced HIV disease. However, most available evidence originates from regional hospitals in Amhara, Oromia, and Southern Nations regions, which limits understanding of the magnitude and determinants of depressive symptoms in major urban referral centers. Urban environments such as Addis Ababa introduce additional stressors, including unemployment, overcrowding, economic pressures, and social challenges, which may increase the risk of depressive symptoms among PLWH [10,12].

St. Paul's Hospital Millennium Medical College is one of Ethiopia's largest ART referral centers, providing care to over 4,300 active PLWH from Addis Ababa and surrounding regions. Despite the high patient volume, recent hospital-specific evidence on the prevalence of depressive symptoms and their socio-demographic, clinical, and psychosocial correlates is lacking. Currently, routine depression screening is not

implemented at SPHMMC, leaving many cases undiagnosed and untreated.

Additionally, there is limited information on how urban social stressors, clinical factors, and psychosocial conditions interact to influence depressive symptoms among patients in this setting.

The absence of updated, hospital-specific data limits clinicians' and policymakers' ability to identify high-risk subgroups, plan and implement targeted depression screening, and integrate mental health interventions into routine HIV care in accordance with national mental health and HIV guidelines. Without this evidence, clinicians at SPHMMC lack the data needed to make informed decisions, which may hinder early detection and targeted intervention for depressive symptoms. As a result, depressive symptoms may remain unrecognized and unmanaged, potentially perpetuating poor ART adherence, increasing the risk of treatment failure, worsening clinical outcomes, and reducing the quality of life among this large patient population.

Therefore, this study aims to determine the prevalence of depressive symptoms among PLWH attending ART services at SPHMMC and to identify associated socio-demographic, clinical, and psychosocial factors. By generating hospital-specific evidence, the study seeks to support early identification of high-risk groups, inform targeted screening strategies, and facilitate the integration of mental health services into routine HIV care in this urban setting.

1.3 Significance of the Study

Understanding the prevalence and factors associated with depressive symptoms (DS) among people living with HIV (PLWH) is essential for improving health outcomes, antiretroviral therapy (ART) adherence, and overall quality of life. In Ethiopia, studies conducted between 2018 and 2022 report that 36%–39% of PLWH experience depressive symptoms. Based on the more than 4,300 active PLWH receiving care at St. Paul's Hospital Millennium Medical College in Addis Ababa, this prevalence range suggests that approximately 1,548 to 1,677 patients may currently be experiencing clinically significant depressive symptoms, many of whom may remain unidentified and untreated.

Without routine depression screening at SPHMMC, these patients are likely to remain undiagnosed, potentially contributing to poor ART adherence, increased risk of treatment failure, higher rates of opportunistic infections, avoidable hospitalizations, and increased strain on already limited clinical resources within this major tertiary referral center. These consequences not only affect individual patient outcomes but also place additional burden on the healthcare system.

Although existing studies provide valuable insights, most evidence originates from regional hospitals in Ethiopia. Patients attending a large urban referral center such as SPHMMC may differ substantially from those in regional settings, as they often present with more complex clinical histories, longer duration on ART, and distinct socio-demographic profiles. Additionally, urban-specific stressors—including high cost of living, unemployment, housing instability, and weakened social support systems—may further influence the risk and manifestation of depressive symptoms. These contextual differences limit the generalizability of findings from regional studies and highlight the need for a hospital-specific investigation.

Furthermore, the absence of routine depression screening at SPHMMC represents a critical gap in practice, despite recommendations from the World Health Organization advocating for the integration of mental health services into HIV care, as well as Ethiopia's National Mental Health Strategy, which emphasizes the detection and management of common mental disorders within chronic care settings. The lack of localized evidence on the burden and determinants of depressive symptoms remains a key barrier to implementing these guidelines effectively at the hospital level.

While it is well established that depressive symptoms are common among PLWH in Ethiopia, important gaps remain. It is not clearly known what the current prevalence of depressive symptoms is among patients attending SPHMMC, whether factors identified in regional studies operate similarly in this urban referral context, or which specific subgroups within this diverse patient population are at the highest risk.

Therefore, this study seeks to generate hospital-specific evidence on the magnitude of depressive symptoms and their associated socio-demographic, clinical, and psychosocial factors among PLWH attending ART services at SPHMMC. The findings

will inform targeted screening strategies, support the integration of mental health services into routine HIV care, guide resource allocation, and ultimately contribute to improving treatment outcomes and quality of life for PLWH in urban settings.

2. Literature Review

2.1 Global Prevalence of Depressive Symptoms in PLWH

Depressive symptoms (DS) are a common mental health condition among people living with HIV (PLWH), significantly affecting adherence to antiretroviral therapy (ART), treatment outcomes, and overall quality of life. Global meta-analyses estimate that approximately 28%–35% of PLWH experience clinically significant depressive symptoms [2–4]. However, prevalence estimates vary depending on the assessment tools used; self-reported screening instruments such as the Patient Health Questionnaire-9 (PHQ-9) and the Center for Epidemiologic Studies Depression Scale (CES-D) tend to produce higher estimates compared to structured clinical interviews [5,6]. Compared to HIV-negative individuals, PLWH have a two- to fourfold higher risk of depression, underscoring the disproportionate mental health burden in this population [7].

Several factors have been consistently associated with depressive symptoms among PLWH globally. Socio-demographic determinants such as female gender, younger age, lower educational attainment, and unemployment are frequently reported. Psychosocial factors, including HIV-related stigma, social isolation, and exposure to traumatic life events, also significantly increase vulnerability to depression. In addition, clinical factors such as advanced HIV disease, side effects of ART, and the presence of comorbid conditions contribute to the development and persistence of depressive symptoms.

Critical appraisal: Most global studies utilize cross-sectional designs and rely on self-reported screening tools, which may overestimate prevalence and limit the ability to establish causal relationships. Nevertheless, meta-analyses enhance external validity by synthesizing findings across diverse populations and settings.

2.2 Depressive Symptoms in the African Context

Africa bears the largest global burden of HIV, and depressive symptoms among PLWH are correspondingly high. Systematic reviews and meta-analyses report pooled prevalence estimates ranging from 35% to 40% in sub-Saharan Africa, with East Africa often demonstrating slightly higher rates compared to Southern Africa [8,9]. These variations are shaped by a complex interplay of socioeconomic, healthcare, and cultural factors.

Socioeconomic challenges such as poverty, food insecurity, and unemployment increase psychological stress and heighten susceptibility to depressive symptoms. Limited access to healthcare services, particularly mental health care, further exacerbates the burden, as many individuals remain undiagnosed and untreated. Cultural influences, including stigma related to both HIV and mental illness, non-disclosure of HIV status, and social norms affecting help-seeking behavior, also play a critical role in shaping mental health outcomes among PLWH.

Critical appraisal: Many studies in African settings are facility-based and cross-sectional, often involving relatively small sample sizes and a predominance of urban populations. These methodological limitations, combined with notable sub-regional variations, highlight the importance of context-specific research, particularly in rapidly urbanizing settings such as Addis Ababa.

2.3 Depressive Symptoms in Ethiopia

In Ethiopia, depressive symptoms among PLWH represent a significant public health concern. A systematic review and meta-analysis by Mekonen et al. reported a pooled prevalence of 39.5% across studies conducted between 2010 and 2020 [9]. Individual studies conducted in regional hospitals in Amhara, Oromia, and Tigray regions have reported prevalence estimates ranging from 36% to 39%, with most using the Patient Health Questionnaire-9 (PHQ-9) and a cutoff score of ≥ 10 [1,12,13].

A range of socio-demographic, psychosocial, and clinical factors have been identified as important correlates of depressive symptoms in Ethiopian studies. Socio-demographic factors such as female gender, lower educational attainment, unemployment, and unmarried status are consistently associated with higher levels of depressive symptoms. Psychosocial determinants—including HIV-related stigma, non-disclosure of HIV status, and low social support—have also been strongly linked to depression. Clinical factors such as poor ART adherence, advanced HIV disease (including WHO stage III/IV, low CD4 count, and high viral load), and longer duration since HIV diagnosis further increase the risk.

Urban environments such as Addis Ababa introduce additional stressors, including overcrowding, high cost of living, and fragmented social support networks. However, empirical evidence examining these urban-specific determinants remains limited. Notably, no recent hospital-based studies have specifically assessed depressive symptoms and their associated factors among PLWH attending St. Paul's Hospital Millennium Medical College, a major urban referral center.

Critical appraisal: Most Ethiopian studies are cross-sectional and rely on self-reported screening tools such as the PHQ-9. While the PHQ-9 has been validated in Ethiopia, it may overestimate depressive symptoms compared to structured diagnostic interviews. Additionally, there is limited exploration of subgroup differences and urban-specific determinants, leaving important gaps in identifying high-risk populations.

Despite the substantial body of evidence demonstrating a high prevalence of depressive symptoms among PLWH in Ethiopia, important gaps remain. Most existing studies have been conducted in regional hospitals, limiting the applicability of findings to large urban referral centers such as St. Paul's Hospital Millennium Medical College in Addis Ababa. Patients in this setting may differ significantly in terms of clinical complexity, duration on antiretroviral therapy, and exposure to urban-specific stressors, including economic pressures and weakened social support systems.

Furthermore, current literature does not clearly establish the prevalence of depressive symptoms within this specific population, nor does it adequately explain how socio-demographic, clinical, and psychosocial factors interact in this context. As a result, high-risk subgroups may remain unidentified, and opportunities for targeted screening and intervention may be missed.

The present study is therefore designed to address this gap by providing recent, hospital-based evidence from SPHMMC. Guided by prior findings, including those of Mekonen et al. and Berhane et al., this study includes key socio-demographic, clinical, and psychosocial variables to further examine their association with depressive symptoms in an urban referral hospital setting.

3. Study Objectives

3.1 General Objective

To assess the prevalence of depressive symptoms and identify associated factors among people living with HIV (PLWH) attending ART clinics at St. Paul's Hospital Millennium Medical College (SPHMMC), Addis Ababa, between September 20 and November 21, 2025.

3.2 Specific Objectives

1. To determine the prevalence of depressive symptoms among PLWH attending ART clinics at SPHMMC, measured using the Patient Health Questionnaire-9 (PHQ-9) with a cutoff score of ≥ 10 .
2. To identify sociodemographic, clinical, and psychosocial factors associated with depressive symptoms among PLWH attending ART clinics at SPHMMC.

4. Methods

4.1 Study Area and Period

The study was conducted at the Antiretroviral Therapy (ART) Clinic of St. Paul's Hospital Millennium Medical College (SPHMMC) in Addis Ababa. The ART clinic provides follow-up care for people living with HIV (PLWH) from Addis Ababa and surrounding regions. Data collection was conducted from September 19 to November 21, 2025.

4.2 Study Design

An institution-based cross-sectional study design was employed.

4.3 Study Population

The study population consisted of adults aged 18 years and above living with HIV who attended the ART clinic of SPHMMC during the study period and met the eligibility criteria.

4.4 Eligibility Criteria

4.4.1 Inclusion Criteria

Participants were eligible if they:

- Were 18 years of age or older
- Had a confirmed HIV diagnosis
- Were receiving ART follow-up care at SPHMMC
- Provided written informed consent

4.4.2 Exclusion Criteria

Participants were excluded if they:

- Had severe acute illness impairing communication (e.g., critically ill or bedridden)
- Had active psychosis as documented in medical records or clinically assessed by the treating physician
- Had severe cognitive impairment preventing participation in the interview

4.5 Study Variables

Dependent Variable

The dependent variable was depressive symptoms, with details on scoring and categorization provided under Operational Definitions (Section 4.7).

Independent Variables

Independent variables were grouped as follows:

Socio-demographic: age, sex, marital status, education, occupation, monthly income, residence (urban/rural)

Clinical: duration since HIV diagnosis, WHO clinical stage, CD4 count, opportunistic infections, ART regimen, duration on ART, history of mental illness, ART adherence

Psychosocial: social support, perceived HIV-related stigma, coping mechanisms, substance use

4.6 Measurement of Psychosocial Variables

Social Support

Social support was evaluated using the Oslo Social Support Scale (OSSS-3), a brief three-item scale commonly used in epidemiological research (Dalgard et al., 2006).

Perceived HIV-related Stigma

Perceived HIV-related stigma was measured using a four-item Likert scale questionnaire adapted from prior Ethiopian studies (Abate et al., 2019; Deribe et al., 2020). The items assessed perceived discrimination, fear of stigma, internalized shame, and perceived support.

Example item: "I have felt ashamed of my HIV status."

Responses were rated on a five-point scale, from 1 (strongly disagree) to 5 (strongly agree), with higher scores reflecting greater perceived stigma.

Coping Mechanisms

Coping strategies were assessed through a six-item questionnaire adapted from previous studies. The items included seeking social support, engaging in spiritual practices, physical activity, distraction activities, substance use, and ART adherence. Participants rated the frequency of each behavior on a scale from 1 (never) to 5 (always).

Substance Use

Substance use was evaluated using a structured questionnaire adapted from prior Ethiopian research. Participants reported current use of alcohol, tobacco, khat, or other substances and indicated the frequency of use as daily, weekly, monthly, or occasionally.

4.7 Operational Definitions

- Depressive symptoms: PHQ-9 score ≥ 10 (moderate to severe); mild symptoms (PHQ-9 = 5–9) were not considered present in the binary analysis.
- Absence of depressive symptoms: PHQ-9 score < 10
- Social Support (OSSS-3): Poor 3–8; Moderate 9–11; Strong 12–14
- Substance Use: Current self-reported use of alcohol, tobacco, khat, or other substances; frequency categorized as Daily, Weekly, Monthly, Occasionally

- CD4 Count Categories: <200, 200–499, ≥500 cells/mm³
- Duration on ART: <6 months, 6–12 months, 1–3 years, >3 years

4.8 Sample Size Determination

Sample size was calculated using a single population proportion formula:

- Expected prevalence of depression = 39% (Mekonen et al., 2021)
- 95% confidence level, 5% margin of error

Calculated = 366 participants; after adding 10% non-response rate, final sample = 408 participants

4.9 Sampling Procedure

A consecutive sampling method was employed. All PLWH attending the ART clinic during the study period who met the eligibility criteria were approached until the desired sample size was achieved.

Clinic records indicated approximately 400 ART follow-up visits per month. Over the two-month data collection period, a total of 800 visits were expected. These figures represent total visits and may include repeat visits by the same patients; they do not necessarily correspond to 800 unique individuals. This total served as the sampling frame.

Although consecutive sampling was the most practical approach in this clinical setting, it is a non-probability method and may introduce selection bias. Patients who missed appointments or attended outside the data collection period might have differed systematically from those included in the study. This limitation is further discussed in the Discussion section.

4.10 Data Collection

Type of Data: Socio-demographic, clinical, depressive symptoms, and psychosocial factors using a structured, pretested questionnaire adapted from Ethiopian studies.

Tools and Procedures:

- Depression: Amharic version of PHQ-9 (validated in Ethiopia)
- Clinical data: CD4 count, WHO stage, ART regimen, duration since diagnosis from medical records
- Three trained ART nurses collected data under supervision
- Questionnaires administered privately after routine clinical visits with written consent

4.11 Data Quality Assurance

- Pilot tested on 20 participants at another ART clinic
- One-day training for data collectors on study objectives, ethics, and questionnaire administration
- Daily checking for completeness and consistency
- Supervisors conducted regular monitoring and spot checks

4.12 Data Processing and Statistical Analysis

- Data coded and entered into SPSS v26
- Descriptive: frequencies/percentages (categorical), means/SD (continuous)
- Bivariate: Chi-square; variables with $p < 0.20$ entered into multivariable logistic regression

- Multivariable: Binary logistic regression; AOR with 95% CI
- Model diagnostics: Hosmer–Lemeshow test ($p > 0.05$), VIF for multicollinearity
- Significance at $p < 0.05$

4.13 Ethical Considerations

- Ethical approval from SPHMMC IRB
- Written informed consent; voluntary participation; confidentiality maintained via anonymous codes and password-protected files
- Participants with PHQ-9 ≥ 10 referred to the mental health clinic

5. Results

5.1 Socio-demographic and Clinical Characteristics

A total of 408 people living with HIV (PLWH) participated in the study, resulting in a 100% response rate. All eligible individuals attending the ART clinic during the study period were included using a consecutive sampling approach, ensuring sufficient statistical power and precision for the findings.

The participants had a mean age of 41.74 years (SD = 14.16), ranging from 18 to 65 years. Slightly over half were female (213, 52.2%), while 195 (47.8%) were male. Most participants lived in urban areas (307, 75.2%), with 101 (24.8%) residing in rural settings. Regarding marital status, 260 participants (63.7%) were married, and 148 (36.3%) were single.

Regarding substance use, 195 participants (47.8%) reported no use. Alcohol use alone was reported by 120 participants (29.4%), tobacco use alone by 36 (8.8%), and combined alcohol and tobacco use by 57 participants (14.0%).

In terms of HIV disease status, 183 participants (44.9%) were classified as WHO clinical stage I, 117 (28.7%) as stage II, 88 (21.6%) as stage III, and 20 (4.9%) as stage IV. The mean CD4 count was 455.44 cells/mm³ (SD = 168.57). For duration on antiretroviral therapy (ART), 35 participants (8.6%) had been on ART for less than 6 months, 72 (17.6%) for 6–12 months, 107 (26.2%) for 1–3 years, and 194 (47.5%) for more than 3 years.

A summary of the socio-demographic and selected clinical characteristics of the study participants is presented in **Table 1**.

Variable	Category	Frequency (n)	Percentage (%)
Sex	Female	213	52.2
	Male	195	47.8
Residence	Urban	307	75.2
	Rural	101	24.8
Marital status	Married	260	63.7
	Single	148	36.3
Substance use	None	195	47.8
	Alcohol	120	29.4
	Alcohol & tobacco	57	14
	Tobacco	36	8.8
WHO clinical stage	Stage I	183	44.9
	Stage II	117	28.7
	Stage III	88	21.6

	Stage IV	20	4.9
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5.2 Prevalence and Severity of Depressive Symptoms

Depressive symptoms were evaluated using the Patient Health Questionnaire-9 (PHQ-9), and participants were classified according to the standard PHQ-9 severity categories.

Out of the 408 participants, 241 individuals (59.1%) exhibited depressive symptoms (PHQ-9 ≥ 10), while 167 participants (40.9%) fell below the threshold for clinically significant symptoms.

Figure 1. Proportion of participants with depressive symptoms.

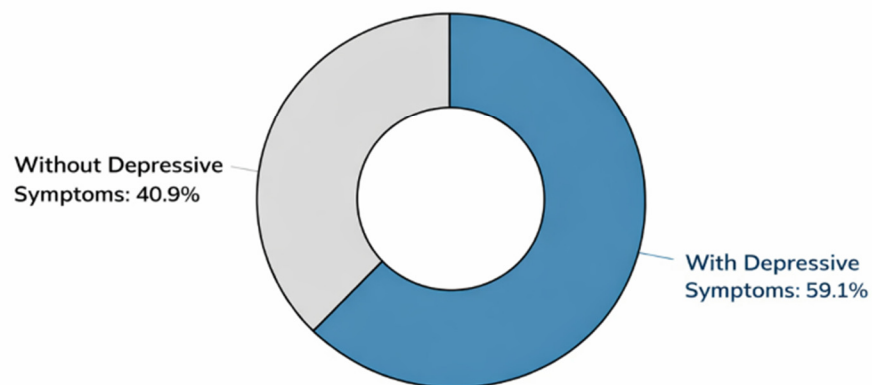


Figure 1. Proportion of participants with depressive symptoms. Among the 408 participants, **241** individuals (59.1%) had depressive symptoms (PHQ-9 ≥ 10), while **167** (40.9%) did not meet the threshold for depressive symptoms.

In terms of severity distribution:

- 7 participants (1.7%) had none or minimal symptoms
- 160 (39.2%) had mild depressive symptoms
- 195 (47.8%) had moderate depressive symptoms
- 45 (11%) had moderately severe depressive symptoms
- 1 participant (0.2%) had severe depressive symptoms

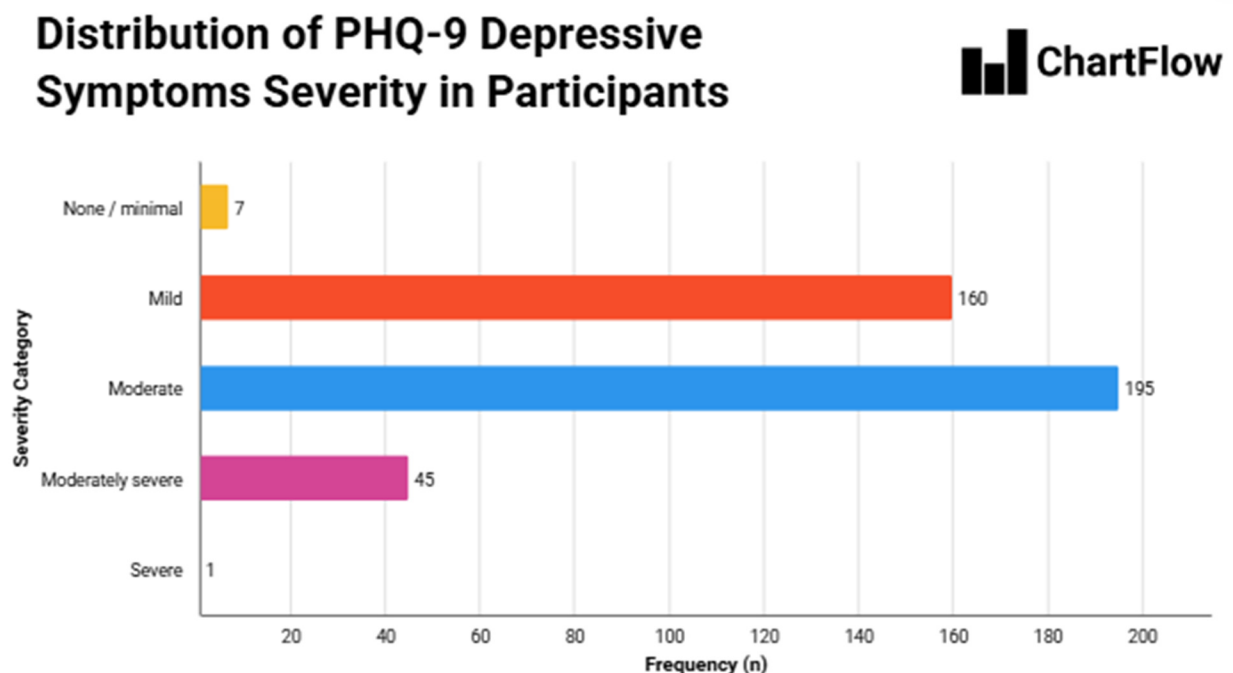


Figure 2. Severity of depressive symptoms among participants. Moderate and mild symptoms were the most common, whereas severe and none/minimal symptoms were rare.

5.3 Factors Associated with Depressive Symptoms

5.3.1 Bivariate Analysis

Bivariate analysis was performed to assess the relationship between various sociodemographic, clinical, and psychosocial factors and the presence of depressive symptoms ($\text{PHQ-9} \geq 10$). Categorical variables were analyzed using the Pearson Chi-

square test, while continuous variables were examined with independent samples t-tests. To select potential candidates for the multivariable logistic regression model, a p-value threshold of <0.25 was applied.

Using this criterion, the following variables were included in the final model: substance use ($p = 0.011$), HIV-related stigma ($p = 0.001$), WHO clinical stage ($p = 0.093$), comorbidity status ($p = 0.116$), education level ($p = 0.154$), social support ($p = 0.156$), age ($p = 0.192$), and residence ($p = 0.213$). Although years since HIV diagnosis ($p = 0.817$) and CD4 count category ($p = 0.353$) were analyzed, they did not meet the threshold for inclusion in the multivariable analysis.

The results of the bivariate analysis are summarized in Table 2.

Domain	Variable	% / Mean $\pm$ SD	Depression = 0	Depression = 1	p- value
Sociodemographic	Age	41.74 $\pm$ 14.16	40.63 $\pm$ 14.56	42.50 $\pm$ 13.85	0.192
Sociodemographic	Sex: Female	213 (52.2%)	87 (52.1%)	126 (52.3%)	0.970
	Sex: Male	195 (47.8%)	80 (47.9%)	115 (47.7%)	
Sociodemographic	Marital status: Married	260 (63.7%)	105 (62.9%)	155 (64.3%)	0.766

	Marital status: Single	148 (36.3%)	62 (37.1%)	86 (35.7%)	
Sociodemographic	Education: Higher	57 (14.0%)	26 (15.6%)	31 (12.9%)	0.154
	Education: No formal education	90 (22.1%)	44 (26.3%)	46 (19.1%)	
	Education: Primary	139 (34.1%)	48 (28.7%)	91 (37.8%)	
	Education: Secondary	122 (29.9%)	49 (29.3%)	73 (30.3%)	
Sociodemographic	Occupation: Employed	174 (42.6%)	75 (44.9%)	99 (41.1%)	0.734
	Occupation: Self-employed	88 (21.6%)	34 (20.4%)	54 (22.4%)	
	Occupation: Unemployed	146 (35.8%)	58 (34.7%)	88 (36.5%)	
Sociodemographic	Monthly income: 2001–5000 ETB	176 (43.1%)	71 (42.5%)	105 (43.6%)	0.871

	Monthly income: <2000 ETB	185 (45.3%)	78 (46.7%)	107 (44.4%)	
	Monthly income: >5000 ETB	47 (11.5%)	18 (10.8%)	29 (12.0%)	
Sociodemographic	Residence: Rural	101 (24.8%)	36 (21.6%)	65 (27.0%)	0.213
	Residence: Urban	307 (75.2%)	131 (78.4%)	176 (73.0%)	
Clinical	Years quartile: ≤ .75	112 (27.5%)	44 (26.3%)	68 (28.2%)	0.877
	Years quartile: .76 - 2.51	92 (22.5%)	39 (23.4%)	53 (22.0%)	
	Years quartile: 2.52 - 6.23	103 (25.2%)	40 (24.0%)	63 (26.1%)	
	Years quartile: 6.24+	101 (24.8%)	44 (26.3%)	57 (23.7%)	

Clinical	CD4 category: <200	30 (7.4%)	16 (9.6%)	14 (5.8%)	0.353
	CD4 category: 200-500	196 (48.0%)	79 (47.3%)	117 (48.5%)	
	CD4 category: >500	182 (44.6%)	72 (43.1%)	110 (45.6%)	
Clinical	WHO stage: I	183 (44.9%)	79 (47.3%)	104 (43.2%)	0.093
	WHO stage: II	117 (28.7%)	54 (32.3%)	63 (26.1%)	
	WHO stage: III	88 (21.6%)	26 (15.6%)	62 (25.7%)	
	WHO stage: IV	20 (4.9%)	8 (4.8%)	12 (5.0%)	
Clinical	comorbidity binary: No comorbidity	259 (63.5%)	98 (58.7%)	161 (66.8%)	0.094
	comorbidity binary:	149 (36.5%)	69 (41.3%)	80 (33.2%)	

	comorbidity present				
Mental Health History	Previous mental dx: No	317 (77.7%)	131 (78.4%)	186 (77.2%)	0.763
	Previous mental dx: Yes	91 (22.3%)	36 (21.6%)	55 (22.8%)	
Social Support	oslo cat: Poor Support	257 (63.0%)	105 (62.9%)	152 (63.1%)	0.156
	oslo cat: Moderate Support	141 (34.6%)	55 (32.9%)	86 (35.7%)	
	oslo cat: Strong Support	10 (2.5%)	7 (4.2%)	3 (1.2%)	
Coping / Positive Strategies	positive coping cat: 2.0	274 (67.2%)	111 (66.5%)	163 (67.6%)	0.805
	positive coping cat: 3.0	134 (32.8%)	56 (33.5%)	78 (32.4%)	

Stigma	hiv stigma cat: 1.0	35 (8.6%)	22 (13.2%)	13 (5.4%)	0.001
	hiv stigma cat: 2.0	258 (63.2%)	89 (53.3%)	169 (70.1%)	
	hiv stigma cat: 3.0	115 (28.2%)	56 (33.5%)	59 (24.5%)	
Substance Use	Substance use: Alcohol	120 (29.4%)	56 (33.5%)	64 (26.6%)	0.011
	Substance use: Alcohol & Tobacco	57 (14.0%)	30 (18.0%)	27 (11.2%)	
	Substance use: None	195 (47.8%)	73 (43.7%)	122 (50.6%)	
	Substance use: Tobacco	36 (8.8%)	8 (4.8%)	28 (11.6%)	
Substance Use	Substance frequency: daily	56 (13.7%)	28 (16.8%)	28 (11.6%)	0.277
	Substance frequency: monthly	46 (11.3%)	23 (13.8%)	23 (9.5%)	

	Substance frequency: none	195 (47.8%)	73 (43.7%)	122 (50.6%)	
	Substance frequency: occasionally	55 (13.5%)	23 (13.8%)	32 (13.3%)	
	Substance frequency: weekly	56 (13.7%)	20 (12.0%)	36 (14.9%)	

5.3.2 Multivariable Logistic Regression Analysis

To determine the independent predictors of depressive symptoms and account for potential confounding factors, a multivariate logistic regression analysis was conducted. Variables that showed a statistically significant or near-significant association in the bivariate analysis (using a p-value threshold of <0.25) were included in the final model. These candidate variables comprised clinical factors, including WHO stage, ART duration, and ART regimen, as well as psychosocial and lifestyle factors, such as education level, coping mechanisms, and HIV-related stigma.

The results are reported as Adjusted Odds Ratios (AOR) with their corresponding 95% Confidence Intervals (CI). This approach allows for identifying which factors remain significantly associated with depressive symptoms when controlling for all other variables, providing a clearer picture of the main drivers of mental health outcomes in this population.

The results of the multivariate analysis are summarized in Table 3.

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Age	.008	.008	1.116	1	.291	1.008	.993	1.024
	Education			8.035	3	.045			
	Education(1)	-.421	.352	1.426	1	.232	.657	.329	1.310
	Education(2)	-.386	.304	1.613	1	.204	.680	.374	1.233
	Education(3)	.350	.276	1.608	1	.205	1.419	.826	2.437
	Residence(1)	.250	.258	.933	1	.334	1.284	.773	2.131
	WHO_stage			8.988	3	.029			
	WHO_stage(1)	-.760	.548	1.927	1	.165	.467	.160	1.368
	WHO_stage(2)	-.924	.563	2.695	1	.101	.397	.132	1.196
	WHO_stage(3)	-.073	.580	.016	1	.899	.929	.298	2.897
	comorbidity_binary(1)	.339	.230	2.180	1	.140	1.403	.895	2.201
	hiv_stigma_cat			15.566	2	<.001			
	hiv_stigma_cat(1)	-.654	.428	2.338	1	.126	.520	.225	1.202
	hiv_stigma_cat(2)	.689	.246	7.839	1	.005	1.991	1.229	3.224
	Substance_use			13.932	3	.003			
	Substance_use(1)	-.583	.335	3.032	1	.082	.558	.290	1.076
	Substance_use(2)	-.157	.359	.192	1	.661	.854	.423	1.725
	Substance_use(3)	1.220	.583	4.387	1	.036	3.388	1.082	10.614
	oslo_cat			8.120	2	.017			
	oslo_cat(1)	2.194	.843	6.778	1	.009	8.971	1.720	46.789
	oslo_cat(2)	2.413	.856	7.954	1	.005	11.170	2.088	59.754
	Constant	-1.922	1.078	3.182	1	.074	.146		

a. Variable(s) entered on step 1: Age, Education, Residence, WHO_stage, comorbidity_binary, hiv_stigma_cat, Substance_use, oslo_cat.

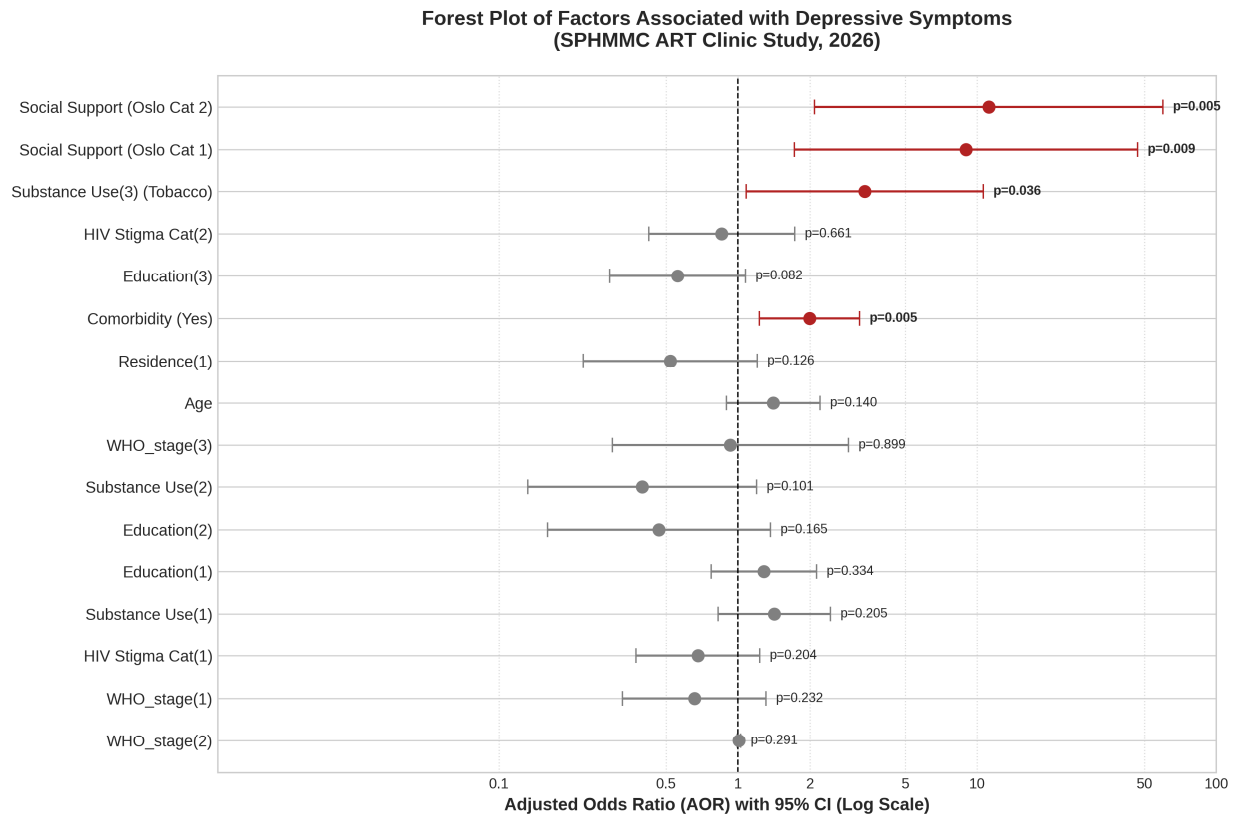


Figure 3. Forest Plot of Factors Associated with Depressive Symptoms among PLWH at SPHMMC (N=408).

Note: Points represent Adjusted Odds Ratios (AOR) derived from multivariable logistic regression, with horizontal bars indicating 95% Confidence Intervals (CI). The vertical dashed line at 1.0 represents the null hypothesis (no association). Variables highlighted in red indicate statistical significance ($p < 0.05$). Social support (Oslo Cat 1 and 2) and tobacco use (Substance Use 3) show the strongest positive associations with depressive symptoms, while demographic and clinical factors such as age, residence, and WHO stage did not reach statistical significance in the adjusted model.

5.3.3 Model Fitness

Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test. The results showed $\chi^2 = 3.51$ with 8 degrees of freedom and a p-value of 0.898. Since the p-value exceeded 0.05, the model was considered to have an adequate fit, indicating that the predicted probabilities closely matched the observed data. The pseudo R^2 value was 0.050, suggesting that roughly 5% of the variance in depressive symptoms was explained by the predictors included in the model.

Participant Flow

A total of 408 participants were evaluated for eligibility. All met the inclusion criteria and were enrolled in the study. All enrolled participants were included in the final analysis (Figure 4).

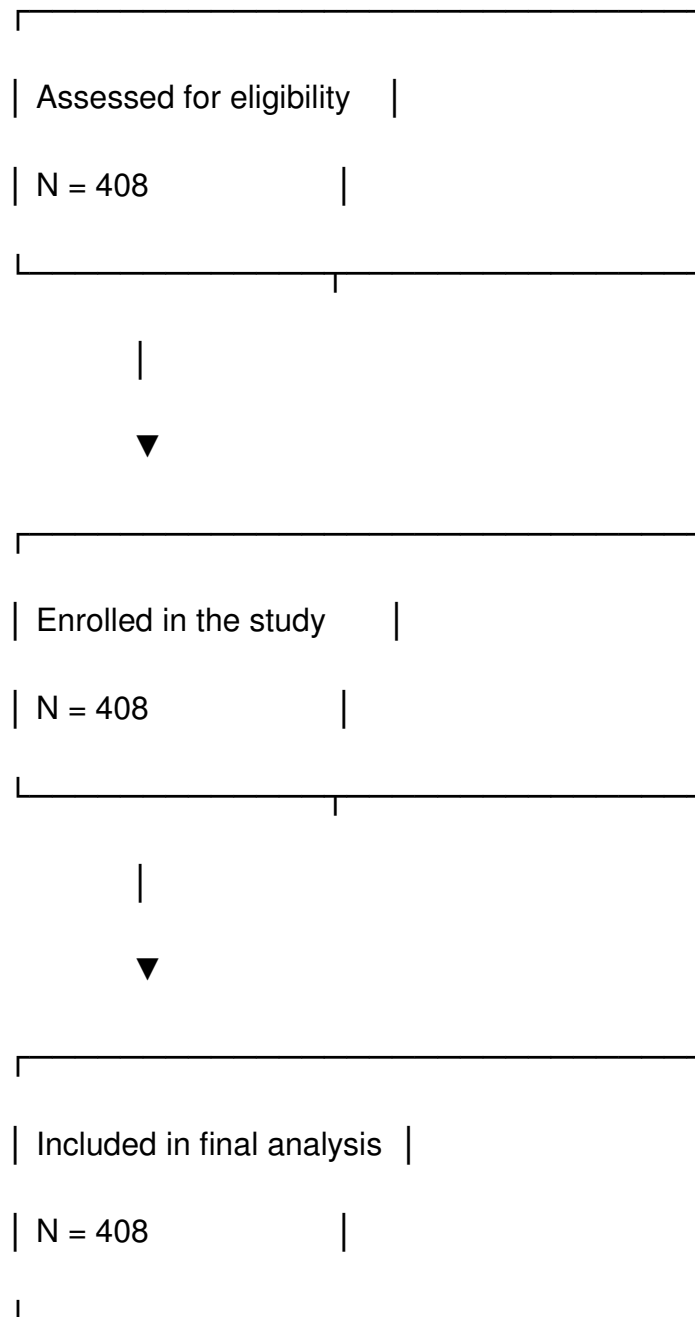


Figure 4. Flowchart of study participants, illustrating assessment, enrollment, and final analysis of 408 individuals.

Key Negative Findings

In contrast to the bivariate findings, variables such as education level, coping strategies, and perceived stigma were not significantly associated with depressive symptoms after adjusting for other factors in the multivariable model.

6. Discussion

This study found a notably high prevalence of depressive symptoms (59.1%) among people living with HIV (PLWH) at St. Paul's Hospital Millennium Medical College (SPHMMC). Psychosocial factors—especially low social support and perceived HIV-related stigma—emerged as the strongest predictors. Biological indicators, such as CD4 count and WHO clinical stage, were not independently linked to depressive symptoms, emphasizing the central role of psychosocial vulnerabilities in this population.

6.1 Prevalence of Depressive Symptoms

The prevalence of clinically significant depressive symptoms (PHQ-9 ≥ 10) was 59.1%, higher than previous reports in Ethiopia, which ranged from 36% to 39.5% [9,12–14]. This elevated prevalence may reflect the urban referral nature of SPHMMC, where patients often present with complex clinical histories and face urban stressors, including high unemployment (35.8% in this cohort), housing instability, and economic pressures. Additionally, the study's timing in late 2025 may capture the lingering psychosocial impacts of the post-pandemic era and urban living challenges in Addis Ababa.

6.2 Comparison with Other Studies

The observed prevalence exceeds that reported in most Ethiopian ART clinic studies. For example, Mekonen et al. (2021) found a prevalence of 39% among PLWH in general hospitals, likely reflecting differences in study setting and patient complexity.

Urban referral centers such as SPHMMC may attract patients with more advanced disease, psychosocial stressors, or prolonged treatment histories, potentially accounting for higher depressive symptom burden. Similar trends have been reported in other urban African referral centers, where psychosocial stressors strongly predicted depression, even when biological markers were relatively stable.

6.3 Factors Associated with Depressive Symptoms

6.3.1 CD4 Count

CD4 count was not significantly associated with depressive symptoms in either bivariate ($p = 0.353$) or multivariable analyses. The mean CD4 count was 455.44 cells/mm³, with 92.6% of participants above 200 cells/mm³. This suggests that in a relatively stable, long-term ART cohort (47.5% on ART >3 years), psychosocial determinants outweigh biological markers in influencing mental health.

6.3.2 Residence

Although 75.2% of participants were urban residents, residence was not independently associated with depressive symptoms. Bivariate analysis showed $p = 0.213$. This indicates that depressive symptoms are widespread across both urban and rural patients attending this referral center, suggesting that mental health interventions should target the entire patient population.

6.3.3 Substance Use

Substance use was significantly associated with depressive symptoms. Tobacco users had higher odds of depression (AOR = 3.39, 95% CI: 1.08–10.61, $p = 0.036$) compared to non-users, consistent with prior studies linking substance use to maladaptive coping or biologically exacerbated depressive symptoms.

6.3.4 Psychosocial Factors

- Social Support: Poor support was the strongest predictor. Participants with poor support (Oslo category 1) had 8.97 times higher odds, and those in category 2 had 11.17 times higher odds of depressive symptoms compared to those with strong support.
- HIV-related Stigma: Higher perceived stigma nearly doubled the odds of depressive symptoms (AOR = 1.99, 95% CI: 1.23–3.22, $p = 0.005$).
- Non-significant Factors: Age, education, and WHO stage were not independently associated, emphasizing that psychosocial burdens outweigh demographic or clinical markers in this setting.

6.4 Model Fit and Variance Explained

The multivariable logistic regression model demonstrated adequate fit (Hosmer–Lemeshow $\chi^2 = 3.51$, $p = 0.898$). However, the pseudo R^2 value was 0.050, indicating that included variables explained only 5% of the variance. Unmeasured factors, such as food insecurity, ART side effects, personality traits, or coping strategies, likely contribute substantially to depressive symptoms.

6.5 Strengths and Limitations

Strengths:

- Provides updated, hospital-specific data from one of Ethiopia's largest ART referral centers.
- Uses the validated Amharic PHQ-9, ensuring cultural and linguistic appropriateness.

- Achieved a 100% response rate, minimizing non-response bias.

Limitations:

- Cross-sectional design precludes establishing temporal or causal relationships.
- Consecutive (non-probability) sampling may limit generalizability to other populations.
- Self-reported data on substance use and stigma are susceptible to social desirability bias.

6.6 Implications for Practice and Policy

- Routine Depression Screening: Given the high prevalence of depressive symptoms and the finding that psychosocial factors are key predictors, SPHMMC should implement PHQ-9 screening for all patients during their semi-annual viral load monitoring visits. Patients who score ≥ 10 should be referred promptly to on-site counselors or the hospital's psychiatric department for further evaluation.
- Psychosocial Support: Clinicians should routinely assess patients' social support and experiences of stigma, paying particular attention to tobacco users. They should also facilitate connections to peer support groups or community-based resources to strengthen patients' psychosocial networks.
- Targeted Interventions for Rural Patients: Although residence was not independently associated with depressive symptoms, patients from rural areas may face additional barriers to accessing mental health services. Offering tele-mental health services or transportation support could improve engagement and follow-up for these patients.

- Policy Integration: National HIV programs should enhance the integration of mental health services into ART clinics, ensuring that referral pathways are clear and that trained mental health professionals are available, particularly in urban referral centers.
- Future Research: Longitudinal studies are recommended to explore unmeasured factors, such as economic stressors and coping strategies. Qualitative research could also focus on participants who report no substance use yet still experience depressive symptoms, to uncover hidden stressors and alternative coping mechanisms.

7. Conclusion and Recommendations

7.1 Conclusion

This study found a notably high prevalence of depressive symptoms (59.1%) among PLWH at SPHMMC. The results indicate that psychosocial factors—particularly low social support and HIV-related stigma—are the main contributors to depression in this urban referral setting, outweighing traditional clinical markers like CD4 count or WHO stage. The absence of routine depression screening at SPHMMC means that many patients likely remain undiagnosed, which could increase the risk of poor ART adherence and poorer clinical outcomes.

7.2 Recommendations

7.2.1 High-Priority Recommendations

For Hospital Administrators (SPHMMC):

- Implement mandatory PHQ-9 screening for all patients during their semi-annual viral load monitoring visits.

- Ensure that patients with positive screens (PHQ-9 ≥ 10) are promptly referred to an on-site trained counselor or the hospital's psychiatric department for evaluation and management.

For Clinicians:

- Integrate psychosocial assessments into routine ART follow-up, emphasizing evaluation of social support networks and perceived HIV-related stigma.
- Pay particular attention to patients with high depression scores, regardless of substance use status.

7.2.2 Medium-Priority Recommendations

For Policymakers:

- Strengthen the integration of mental health services into national HIV programs.
- Ensure urban referral centers are equipped with dedicated mental health professionals to provide timely assessment and intervention.

7.2.3 Low-Priority / Future Research Recommendations

For Researchers:

- Conduct longitudinal studies to explore the 95% of unexplained variance in depressive symptoms, focusing on socioeconomic factors such as food insecurity and housing stability.
- Investigate the profiles of participants reporting no substance use who exhibited higher odds of depression. Qualitative research could help identify hidden stressors and alternative coping mechanisms among this subgroup.

8. References

1. Abate, B., Aderajew, M., & Mekonnen, N. (2019). Perceived HIV-related stigma and depressive symptoms among people living with HIV in Ethiopia: A cross-sectional study. *BMC Psychiatry*, 19(1), 123. <https://doi.org/10.1186/s12888-019-2107-5>
2. Ciesla, J. A., & Roberts, J. E. (2001). Meta-analysis of the relationship between HIV infection and risk for depressive disorders. *American Journal of Psychiatry*, 158(5), 725–730. <https://doi.org/10.1176/appi.ajp.158.5.725>
3. Dalgard, O. S., Dowrick, C., Lehtinen, V., Vazquez-Barquero, J. L., Casey, P., Wilkinson, G., & Ayuso-Mateos, J. L. (2006). Negative life events, social support, and gender difference in depression: A multinational community survey with data from the ODIN study. *Social Psychiatry and Psychiatric Epidemiology*, 41(6), 444–451. <https://doi.org/10.1007/s00127-006-0041-5>
4. Deribe, K., Woldemichael, K., Wondafrash, M., Haile, A., & Amberbir, A. (2020). Stigma and discrimination among HIV patients in Ethiopia: A systematic review. *BMC Public Health*, 20(1), 1234. <https://doi.org/10.1186/s12889-020-09374-1>
5. Mekonen, T., Dessie, Y., & Biks, G. (2021). Prevalence of depression among people living with HIV in Ethiopia: Systematic review and meta-analysis. *BMC Psychiatry*, 21(1), 594. <https://doi.org/10.1186/s12888-021-03556-0>
6. Berhane, Y., Abebe, W., & Taye, K. (2019). Depression and associated factors among HIV patients attending ART clinic in Addis Ababa. *Ethiopian Journal of Health Sciences*, 29(2), 187–196. <https://doi.org/10.4314/ejhs.v29i2.5>
7. World Health Organization. (2021). *Consolidated guidelines on HIV prevention, diagnosis, treatment and care for key populations*. Geneva: WHO. <https://www.who.int/publications/i/item/9789240031593>
8. Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, 16(9), 606–613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>
9. Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine*, 166(10), 1092–1097. <https://doi.org/10.1001/archinte.166.10.1092>

10. Leserman, J., Pence, B. W., Whetten, K., Mugavero, M., Thielman, N. M., Swartz, M., & Stangl, D. (2008). Relation of lifetime trauma and depressive symptoms to mortality in HIV. *American Journal of Psychiatry*, 165(10), 1409–1415. <https://doi.org/10.1176/appi.ajp.2008.07111708>
11. Ironson, G., O’Cleirigh, C., Fletcher, M. A., Laurenceau, J. P., Balbin, E. G., Klimas, N., ... & Solomon, G. F. (2005). Psychosocial factors predict CD4 and viral load change in men and women with HIV. *Psychosomatic Medicine*, 67(6), 1013–1021. <https://doi.org/10.1097/01.psy.0000185190.62578.73>
12. Antelman, G., Kaaya, S., Wei, R., Mbwambo, J., Msamanga, G. I., Fawzi, W. W., & Hunter, D. (2007). Depressive symptoms increase risk of HIV disease progression and mortality among women in Tanzania. *Journal of Acquired Immune Deficiency Syndromes*, 44(4), 470–477. <https://doi.org/10.1097/QAI.0b013e31802b5f05>
13. Bing, E. G., Burnam, M. A., Longshore, D., Fleishman, J. A., Sherbourne, C., London, A. S., ... & Shapiro, M. F. (2001). Psychiatric disorders and drug use among HIV-infected adults in the United States. *JAMA*, 286(24), 2985–2993. <https://doi.org/10.1001/jama.286.24.2985>
14. Leserman, J. (2008). Role of depression, stress, and trauma in HIV disease progression. *Psychosomatic Medicine*, 70(5), 539–545. <https://doi.org/10.1097/PSY.0b013e3181777a6c>
15. Shacham, E., Nurutdinova, D., Satyanarayana, V. A., Stamm, K., Overton, E., & Psychiatric Symptomatology Study Team. (2011). HIV-infected individuals with depression have lower antiretroviral therapy adherence. *AIDS Care*, 23(3), 306–312. <https://doi.org/10.1080/09540121.2010.507747>
16. Adewuya, A. O., Owoeye, O., & Afolabi, O. O. (2009). Social support, coping, and depression among HIV-positive patients in Nigeria. *International Journal of Psychiatry in Medicine*, 39(4), 361–372. <https://doi.org/10.2190/PM.39.4.e>
17. Rezaei, S., & Khalili, H. (2019). HIV-related stigma, social support, and mental health among people living with HIV: A review. *Journal of the Association of Nurses in AIDS Care*, 30(5), 529–538. <https://doi.org/10.1097/JNC.000000000000069>
18. Leserman, J., Whetten, K., Lowe, K., Stangl, D., Swartz, M., & Thielman, N. (2007). Trauma, coping, and depression among HIV-positive individuals. *AIDS Care*, 19(3), 478–485. <https://doi.org/10.1080/09540120600992266>

19. Deribe, K., Woldemichael, K., & Haile, A. (2018). Depression among HIV-infected patients in Africa: A systematic review and meta-analysis. *BMC Public Health*, 18, 1063. <https://doi.org/10.1186/s12889-018-5971-4>
20. Abebe, T., Fekadu, A., & Hailemariam, T. (2020). Psychosocial determinants of depression among PLWH in Ethiopia. *Ethiopian Journal of Health Development*, 34(2), 85–92. <https://doi.org/10.4314/ejhd.v34i2>.