Published in final edited form as:

J Int Assoc Physicians AIDS Care (Chic). 2010 ; 9(4): 218–226. doi:10.1177/1545109710371133.

Screening for Hazardous Alcohol Use and Depressive Symptomatology Among HIV-Infected Patients in Nigeria: Prevalence, Predictors, and Association With Adherence

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Abstract

Scores from the Alcohol Use Disorders Identification Test (AUDIT) and the Center for Epidemiological Studies Depression Scale (CES-D) administered to both antiretroviral therapy (ART)-experienced and -naïve adults in HIV care in Nigeria were evaluated for association with participant characteristics and ART adherence measured by pharmacy records. Participants included 222 ART-experienced and 177 ART-naïve adults, of whom 47 (12%) had AUDIT ≥ 8 , 29 (7%) an AUDIT ≥ 10 , 52 (13%) a CES-D ≥ 16 , and 25 (6%) a CES-D ≥ 21 . An elevated AUDIT score was more frequent among ART-naïve and men, while disclosure of HIV status to others was associated with lower scores. An elevated CES-D score was more frequent among ART-naïve and those with lower educational level, while disclosure of HIV status and choosing to be interviewed in English rather than Hausa was associated with lower scores. An elevated CES-D score was associated with poor adherence.

Keywords

alcohol; depression; HIV Infection; adherence; Nigeria

Introduction

As of December 2007, the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organization (WHO) estimated that over 33 million people were living with HIV worldwide, with two thirds of those living in sub-Saharan African countries.¹ By that time, approximately 3 million people were accessing antiretroviral therapy (ART) in low- and middle-income countries worldwide, a more than 7-fold increase over 4 years.² Nigeria is the most populous country in Africa and accounts for approximately one sixth of

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Declaration of Conflicting Interests

The author(s) declared no conflicts of interest with respect to the authorship and/or publication of this article.

Africa's people. While the most recent HIV sero prevalence among adults aged 15 to 49 was 3.1%, the number of people living with HIV in Nigeria is estimated to be 2.6 million due to the large population.³ Similar to many other African nations, Nigeria has made great progress in ART access in recent years, with 16.7% of adults and children with advanced HIV infection reported to be receiving ART by the end of 2007.⁴ While initial reports regarding adherence to ART in sub-Saharan Africa demonstrated favorable levels of adherence by self-report,⁵ subsequent reports have raised concern regarding poor patient retention as well as suboptimal adherence when assessed by pill counts, pharmacy records, or electronic monitoring.⁶⁻¹² We have reported a high frequency of suboptimal adherence based on a study conducted in Nigeria using pharmacy records.¹³ Feasible strategies to identify patient characteristics associated with increased risk of dropout or suboptimal adherence may enhance the effectiveness of ART scale-up programs in sub-Saharan Africa and other resource-constrained settings, as patients with these characteristics could be targeted for more intensive treatment preparation and community-based adherence support prior to ART initiation.

Alcohol use is known to be prevalent among HIV-infected individuals in the United States.¹⁴ Research in sub-Saharan Africa confirms an association between alcohol use and sexual risks for HIV acquisition, based on a high prevalence of hazardous alcohol use in general population samples and an association with HIV sexual transmission in those samples.¹⁵⁻¹⁸ Few studies have reported the prevalence of alcohol use among patients receiving ART. A cross-sectional study of 465 patients in South Africa receiving ART reported a prevalence of 7% for alcohol abuse or dependence using the Mini-International Neuropsychiatric Interview (MINI).¹⁹ Several prospective studies in the United States have linked alcohol use with decreased ART adherence.^{20,21} However, there was a high prevalence of concurrent drug use in these populations. Studies in sub-Saharan Africa are needed to characterize the association between alcohol and ART adherence in non-drug-abusing populations.

Depression is common among HIV-infected individuals in both resource-rich and resource-constrained settings. However, reports of prevalence vary widely due to differences in ascertainment methods and sample characteristics such as stage of disease, age range, gender, and socioeconomic status.²² Retrospective studies in the United States have reported an association between depression and poorer ART adherence and viral control.²³ Improved ART adherence is associated with adherence to antidepressant medication among depressed patients.²⁴ Prospective studies in Uganda and Ethiopia assessing adherence by unannounced pill count or self-report found that higher scores on the Beck Depression Inventory were associated with poorer adherence.^{25,26}

Short questionnaires have been used in a variety of populations to screen for hazardous alcohol use and depressive symptomatology. We utilized the Alcohol Use Disorders Identification Test (AUDIT) and Center for Epidemiological Studies Depression Scale (CES-D) to screen ART-naïve and -experienced HIV-infected adults at a large HIV care program in central Nigeria to establish the prevalence of positive screens for hazardous alcohol use and depressive symptoms and to identify associated patient characteristics in this population. Among ART-experienced participants, we evaluated the association of positive screens for hazardous alcohol use or depressive symptoms with adherence assessed by pharmacy refill records.

Methods

Setting and Participants

The study was conducted in June-July 2007 in an HIV specialty clinic at the University of Abuja Teaching Hospital, a tertiary urban hospital in central Nigeria. The HIV specialty

clinic provides both general HIV care as well as ART and was caring for over 5000 patients at the time of the study. Participants were patients older than 18 years of age, who had been prescribed ART for at least 6 months (ART-experienced group) or were newly presenting to the clinic for HIV care (ART-naïve group). To be eligible to participate, patients needed to be conversant in English or Hausa, the 2 most common languages spoken in this region of Nigeria. The study was approved by the University of Abuja Teaching Hospital Ethics Committee and the University of Maryland School of Medicine Institutional Review Board.

Screening Tools

The AUDIT was developed and validated by the WHO for international use.²⁷ The AUDIT is a 10-item, self-rating questionnaire that assesses hazardous drinking. Standardized responses to the 10 items are scored from 0 to 4 (possible total score 40), with a total score cutoff of 8 having maximal sensitivity and specificity for hazardous alcohol consumption. In this study, we also chose to explore a total score cutoff of 10, as higher cutoffs have been shown to provide better discrimination in the prediction of alcohol-related social problems and medical complications.²⁸ The AUDIT has been used in a variety of international community and primary health care settings, including several African countries.^{16,19,29}

The CES-D was originally validated for use in community and clinic settings to screen for depressive symptomatology in North American populations.³⁰ It has subsequently been used in a variety of African settings.^{19,31-33} The CES-D contains 20 questions that inquire about the presence and frequency of signs and symptoms typically associated with depression. Four standardized responses are rated on a scale of 0 to 3 indicating frequency of the sign or symptom with total scale scores ranging from 0 to 60. Although the measure does not provide a clinical diagnosis of depression, scores above a cutoff of 16 have good sensitivity in predicting the diagnosis of major depression by psychiatrists in a US sample.³⁴ In this study, we also chose to explore a higher cutoff score of 21, as higher cutoffs have been demonstrated to improve the predictive power of the test in medically ill, elderly populations.^{35,36}

Study Procedures

Following informed consent, participants were interviewed privately by 1 of 2 trained research assistants fluent in both English and Hausa. Participants were asked to choose which language they felt most comfortable using for their study interview. The AUDIT and CES-D had been translated in the Hausa language and the translation certified by a clinical psychologist coinvestigator practicing in this region of Nigeria (A.Z.). A brief demographic questionnaire as well as the AUDIT and CES-D were administered on a 1-time basis by interview using the participant's preferred language. To ensure understanding due to differences in literacy levels, the questions were read from the instrument by the research assistant during the interview. Participants with elevated scores on the CES-D were referred to the clinical psychologist coinvestigator (A.Z.) for a brief clinical assessment and offered ongoing counseling. CD4 counts were abstracted from medical records.

For the ART-experienced group, pharmacy refill records for ART medications from the time ART was first dispensed until a uniform cutoff date shortly after the end of the study were reviewed. Days of medication dispensed over the interval were tabulated. A pharmacy refill adherence rate (cumulative days of medication dispensed/cumulative days in the interval) was calculated.

Analysis

Data were analyzed using Statistical Analysis System (SAS) version 9.1.3 (Cary, North Carolina). Internal consistency of responses for the AUDIT and CES-D was assessed by

calculating Cronbach α coefficients. Binary cutoffs for AUDIT scores were defined as ≥ 8 and ≥ 10 . Binary cutoff for CES-D scores are defined as ≥ 16 and ≥ 21 . To compare proportions, chi-square tests were used, and unadjusted odds ratios with 95% confidence intervals were calculated. To investigate the independent associations between participant characteristics and various AUDIT and CES-D cutoffs, we developed separate multivariate logistic regression models. All covariates with a P value $\leq .1$ on univariate analysis were included in multivariate logistic regression models. Adjusted odds ratios with 95% confidence intervals were calculated.

Results

Participants

A total of 399 participants were enrolled, 222 meeting the criteria for the ART-experienced group and 177 meeting the criteria for the ART-naïve group. The ART-experienced group had been treated with ART for a mean of 15 months ($SD \pm 7$ months) prior to enrollment. The groups were similar with respect to gender, age category, marital status, employment status, and preferred language. A similar proportion in each group reported that they had disclosed their HIV status to their spouse, family, friends, or others (Table 1). A higher proportion of ART-experienced participants reported attending school beyond the secondary level (37% vs 24%, $P = .01$). A higher proportion of ART-experienced participants had a CD4 count < 200 cells/mm³ measured at entry into care (61% vs 31%, $P < .0001$).

Alcohol Use Disorders Identification Test Scores

The Cronbach α coefficient for the sample was .87. Forty-seven (12%) participants had an AUDIT score ≥ 8 , and this was more frequent among ART-naïve participants ($P = .06$) on univariate analysis. Twenty-nine (7%) participants had an AUDIT score ≥ 10 , and this was similar for both the ART-naïve and -experienced groups. On univariate analysis, disclosure of HIV status to anyone was associated with a reduced odds of an AUDIT score above either cutoff ($P = .03$, $P = .002$). Excluding those with missing data, 351 (89%) participants were included in a multivariate logistic regression model. On multivariate analysis, male gender was associated with an increased odds of an AUDIT score above either cutoff ($P < .001$, $P = .02$). There was a trend for a reduced odds of AUDIT score ≥ 10 among those preferring to be interviewed in English rather than Hausa and a trend for an increased odds of AUDIT score ≥ 8 among ART-naïve participants (Table 2).

Center for Epidemiological Studies Depression Scale Scores

The Cronbach α coefficient for the sample was .86. Fifty-two (13%) participants had a CES-D score ≥ 16 , and this was more frequent among the ART-naïve group ($P = .02$) on univariate analysis. Twenty-five (6%) participants had a CES-D score ≥ 21 , and this was also more frequent among the ART-naïve group ($P = .05$) on univariate analysis. Excluding those with missing data, 348 (87%) participants were included in multivariate regression models. On multivariate analysis, lower educational level was associated with an increased odds of CES-D score ≥ 16 ($P = .05$). Disclosure of HIV status to anyone was associated with a reduced odds of CES-D ≥ 21 ($P = .05$). Choosing to be interviewed in English rather than Hausa was associated with a reduced odds of CES-D ≥ 16 ($P = .03$). There was a trend for those currently married to have a reduced odds of CES-D ≥ 16 (Table 3). Seven (2%) participants had both an AUDIT score ≥ 8 and a CES-D score ≥ 16 , and this was similar among groups.

ART Pharmacy Refill for ART-Experienced Group

All but 1 of the 222 participants in the ART-experienced group had pharmacy refill records available prior to enrollment. The mean pharmacy refill rate was 110% (SD $\pm$ 19%). Twenty-three (10.4%) of the participants had a pharmacy refill rate <95%, and this was associated with a CES-D $\geq$ 16 (26% vs 8%, $P = .004$) and a CES-D $\geq$ 21 (22% vs 2%, $P < .001$). No association between AUDIT scores and pharmacy refill rate was observed.

Discussion

The overall 12% prevalence of AUDIT scores $\geq$ 8 in this study is lower than a report of alcohol-related problems among Nigerian University students,³⁷ but higher than a report from an urban primary care clinic in Nigeria.³⁸ The prevalence was somewhat higher than that reported in a study of HIV-infected individuals in South Africa using the MINI, which screens for alcohol abuse or dependence rather than hazardous drinking.¹⁹ The robust association with male gender is similar to findings of studies of hazardous alcohol use in patients with and without HIV conducted in Nigeria, South Africa, and Kenya.^{17,19,35} Overall, 24% of the men participating in our study had an AUDIT score $\geq$ 8. Disclosure of HIV status to others was associated with a reduced odds of hazardous alcohol use. This raises concern for increased risk of transmission of HIV to others for those with a positive AUDIT screen. There was a trend for an increased prevalence of hazardous alcohol use in the ART-naïve group compared with the ART-experienced group on multivariate analysis. Although there are alternative explanations such as established patients not disclosing alcohol use to please their care providers, there may be a disproportionate early loss to follow-up among those with hazardous alcohol use. Thus, AUDIT screening as part of ART treatment preparation may identify a group at high risk for default and provide an opportunity for intervention. To this end, future prospective studies are needed to characterize the association of a positive screen for hazardous alcohol use with risk for loss to follow-up among HIV-infected individuals in this setting commencing ART. Additionally, interventions to address the high prevalence of hazardous alcohol use among HIV-infected men in this setting are needed.

We found that 13% of participants overall had a CES-D score $\geq$ 16 and 6% had a score $\geq$ 21. This prevalence of depressive symptomatology is similar to that reported in studies among HIV-infected individuals in South Africa using the MINI¹⁹ and in Senegal using the CES-D.³¹ The prevalence is lower than reports in other studies of HIV-infected individuals in Nigeria and South Africa using the MINI^{39,40} and in Uganda using the CES-D.³² Both the South African and Ugandan studies with higher prevalence were limited to patients newly presenting for HIV care. In our study, the ART-naïve group was at increased risk of higher depressive symptomatology compared with the ART-experienced group on univariate analysis.

The higher prevalence of depressive symptoms among patients newly presenting for care compared with the ART-experienced group may reflect an increased risk for dropout among patients with depressive symptoms, reduction of depressive symptoms among patients who remain engaged in care, or the well-established association between poorer overall health and depression. On multivariate analysis, those with higher educational level or currently married had a lower odds of a score over the lower cutoff of $\geq$ 16, while those who had disclosed their diagnosis to others had a lower odds of a score over the higher cutoff of $\geq$ 21. We have previously reported that these characteristics are also associated with better adherence to ART in this population.¹³ A study in Uganda reported an association between higher CES-D scores and lower CD4 counts among individuals newly presenting for HIV care.²⁹ While prospective studies are needed to better characterize depression among HIV-

infected individuals in this setting, our findings demonstrate the need for the availability of mental health services as a part of comprehensive HIV care in resource-limited settings.

On univariate analysis, those preferring to be interviewed in Hausa were at increased risk for a positive depressive symptom screen compared with those preferring to be interviewed in English. While this may be related to educational level, the association with language persisted when adjusted for education on multivariate analysis. While the CES-D was translated from English by a Nigerian clinical psychologist coinvestigator fluent in the Hausa language, it is possible that the increased risk for Hausa speakers is related to translation issues affecting the understanding of the meaning of questions. There were similar findings in a study in South Africa, which reported that Afrikaans speakers were more likely than Xhosa speakers to have depression defined by the MINI.¹⁹ Those authors speculated that there were underlying social differences between Afrikaans and Xhosa speakers in the expression and weight given to feeling states. An explanation for the language association in this setting warrants exploration in future studies.

The association of a positive depressive symptom screen with poorer adherence assessed by pharmacy refill in the ART-experienced group highlights the potential utility of depression screening as part of ART treatment preparation in resource-limited settings. This association has been well described in resource-rich settings.^{23,24,41} In resource-limited settings, similar findings using the Beck Depression Inventory have been reported among HIV-infected persons in Uganda and Ethiopia.^{25,26} In the Ethiopian study, poor social support as well as a higher Beck Depression Inventory score were associated with poorer adherence, suggesting that ongoing social support may be an important part of a potential intervention. Adherence studies analyzing depression screening with other risk factors for poor adherence in a multivariate fashion will be important to fully characterize the association. Although pharmacy refill records are an indirect measure of adherence, which indicate whether the patient had an adequate supply of medication available, medication availability has been associated with virologic suppression in other studies in the United States and Africa.⁴²⁻⁴⁴

We did not observe an association between a positive AUDIT screen and poorer adherence. This may reflect under-reporting of alcohol use as 50% of the population of Nigeria is Muslim and alcohol use is stigmatized. While the AUDIT has been validated among Nigerian University students, a priority for future studies is the validation of this screening instrument in this population. The study was performed at a single medical institution in central Nigeria. The findings may not be generalizable to other parts of Nigeria or other countries, especially where hazardous alcohol use may be more prevalent. Validation is also important for the CES-D, as data in US studies suggest that depression scales that include somatic symptoms may inflate depression scores in people living with HIV infection.⁴⁵

Both the AUDIT and CES-D were feasible screening tools among HIV-infected persons in this resource-limited setting. Positive screens were more common among participants newly presenting for HIV care, and disclosure of one's HIV status to others was associated with a reduced odds of both hazardous alcohol use and depressive symptomatology. A positive AUDIT screen was more common among men. Higher educational level, being currently married, and completing the interview in English was associated with a reduced odds of CES-D over cutoff. For ART-experienced participants, a CES-D over cutoff was associated with poorer ART adherence. Both screening tools may be helpful in identifying patients at high risk for dropout or poor adherence, who could be targeted for more intensive support upon initiation of ART. Validation and longitudinal studies are needed to further characterize hazardous alcohol use and depressive symptomatology in this population and evaluate the utility of this screening strategy.

Acknowledgments

Funding

The author(s) disclosed receipt of the following financial support for the research and/or authorship of this article: This study was supported in part by grant # 5-D43 TW 01041 from the US National Institutes of Health Fogarty AIRTP and grant # 1 U2G PS000651 from the US Centers for Disease Control and Prevention.

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Table 1

Patients Characteristics of ART-Experienced and ART-Naive Patients, University of Abuja Teaching Hospital, Nigeria

Characteristics	222 ART-Experienced Patients, N (%)	177 ART-Naive Patients, N (%)	P Value Comparing ART-Experienced With ART-Naive
Gender			
Female	156 (70)	116 (65)	.31
Male	66 (30)	61 (35)	
Age (years)			
18-29 years	59 (27)	49 (28)	.97
30-39 years	110 (49)	87 (49)	
≥40 years	53 (24)	41 (24)	
Educational level			
Secondary and below	133 (60)	131 (74)	.01
Postsecondary	77 (35)	42 (24)	
Marital status			
Currently married	125 (56)	105 (59)	.42
Currently not married	97 (44)	69 (40)	
Disclosure of HIV status to anyone			
Yes	216 (98)	167 (96)	.31
No	5 (2)	7 (4)	
Employment status			
Not employed/retired	144 (67)	114 (66)	.89
Present employment	71 (33)	58 (34)	
CD4 absolute count at entry to care			
<200 cells/mm ³	135 (61)	55 (35)	<.0001
≥200 and <350 cells/mm ³	60 (27)	53 (33)	
≥350 cells/mm ³	25 (11)	51 (32)	
Language			
English	199 (90)	151 (88)	.56
Hausa	23 (10)	21 (12)	

Abbreviation: ART, antiretroviral therapy.

Table 2

Patient Characteristics and AUDIT Cutoffs for ART-Experienced and -Naïve Patients, University of Abuja Teaching Hospital, Nigeria

Characteristics	47 (11.8%) Participants With AUDIT >8			29 (7.3%) Participants With AUDIT >10		
	N (%)	Unadjusted OR (95% CI, P Value)	Adjusted OR (95% CI, P Value)	N (%)	Unadjusted OR (95% CI, P Value)	Adjusted OR (95% CI, P Value)
Gender						
Male	31 (66)	5.17 (2.70-9.87, $P < .001$)	5.23 (2.48-11.22, $P < .001$)	17 (59)	3.35 (1.55-7.25, $P = .001$)	3.0 (1.22-7.44, $P = .02$)
Female	16 (34)	Ref		12 (41)	Ref	
Age (years)						
18-29 years	9 (19)	Ref	–	8 (28)	Ref	–
30-39 years	24 (51)	1.53 (0.68-3.41, $P = .76$)		13 (45)	0.88 (0.35-2.20, $P = .61$)	
≥40 years	14 (30)	1.92 (0.79-4.68, $P = .21$)		8 (28)	1.16 (0.42-3.23, $P = .62$)	
Educational level						
Secondary and below	29 (67)	0.93 (0.47-1.82, $P = .82$)	–	20 (74)	1.31 (0.54-3.19, $P = .55$)	–
Post secondary	14 (33)	Ref		7 (26)	Ref	
Marital status						
Currently married	28 (61)	1.14 (0.61-2.14, 0.68)	–	13 (45)	0.56 (0.26-1.20, $P = .14$)	–
Currently not married	18 (38)	Ref		16 (55)	Ref	
Disclosure of HIV status to anyone						
Yes	43 (91)	0.25 (0.07-0.87, $P = .03$)	0.60 (0.11-3.27, $P = .56$)	25 (86)	0.14 (0.04-0.50, $P = .002$)	0.38 (0.07-2.08, $P = .26$)
No	4 (9)	Ref		4 (14)	Ref	
Employment status						
Not employed/retired	26 (60)	0.74 (0.38-1.42, $P = .36$)	–	15 (54)	0.55 (0.25-1.19, $P = .13$)	–
Present employment	17 (39)	Ref		13 (46)	Ref	
CD4 absolute count at entry to care						
<200 cells/mm ³	16 (39)	0.68 (0.29-1.62, $P = .13$)	–	9 (36)	0.71 (0.23-2.18, $P = .20$)	–
≥200, <350 cells/mm ³	17 (40)	1.32 (0.55-3.13, $P = .17$)		11 (44)	1.53 (0.51-4.60, $P = .16$)	
≥350 cells/mm ³	9 (12)	Ref		5 (20)	Ref	
Patient group						
ART naïve	27 (57)	1.82 (0.98-3.36, $P = .06$)	1.88 (0.91-3.88, $P = .09$)	15 (52)	1.38 (0.64-2.93, $P = .41$)	1.51 (0.62-3.67, $P = .36$)
ART experienced	20 (42)	Ref		14 (48)	Ref	

Characteristics	47 (11.8%) Participants With AUDIT >8			29 (7.3%) Participants With AUDIT >10		
	N (%)	Unadjusted OR (95% CI, P Value)	Adjusted OR (95% CI, P Value)	N (%)	Unadjusted OR (95% CI, P Value)	Adjusted OR (95% CI, P Value)
Language						
English	41 (87)	0.84 (0.33-2.11, P = .71)	0.58 (0.19-1.75, P = .33)	23 (79)	0.44 (0.17-1.16, P = .1)	0.36 (0.12-1.13, P = .08)
Hausa	6 (13)	Ref		6 (21)	Ref	

Abbreviations: ART, antiretroviral therapy; AUDIT, Alcohol Use Disorders Identification Test; CI, confidence interval; OR, odds ratio; ref, reference.

Table 3

Patient Characteristics and CES-D Cutoffs for ART-Experienced and -Naïve Patients, University of Abuja Teaching Hospital, Nigeria

Characteristics	52 (13%) Participants With CES-D >16			25 (6%) Participants With CES-D >21		
	N (%)	Unadjusted OR (95% CI, P Value)	Adjusted OR (95% CI, P Value)	N (%)	Unadjusted OR (95% CI, P Value)	Adjusted OR (95% CI, P Value)
Gender						
Male	13 (25)	0.68 (0.35-1.33, $P = .26$)	–	6 (24)	0.66 (0.26-1.69, $P = .39$)	–
Female	39 (75)	Ref		19 (76)	Ref	
Age (years)						
18-29 years	14 (27)	Ref	–	7 (28)	Ref	–
30-39 years	28 (54)	1.11 (0.56-2.22, $P = .47$)		13 (52)	1.02 (0.39-2.64, $P = .76$)	
≥40	10 (19)	0.80 (0.34-1.90, $P = .46$)		5 (20)	0.81 (0.25-2.64, $P = .67$)	
Educational level						
Secondary and below	40 (82)	2.18 (1.02-4.66, $P = .04$)	2.27 (.98-5.23, $P = .05$)	18 (78)	1.67 (0.6-4.6, $P = .32$)	2.08 (0.64-6.79, $P = .22$)
Postsecondary	9 (18)	Ref		5 (22)	Ref	
Marital status						
Currently married	24 (47)	0.6 (0.33-1.1, $P = .09$)	0.54 (0.27-1.1, $P = .07$)	11 (44)	0.54 (0.24-1.23, $P = .14$)	0.55 (0.21-1.44, $P = .22$)
Currently not married	27 (57)	Ref		14 (56)	Ref	
Disclosure of HIV status to anyone						
Yes	48 (94)	0.43 (0.11-1.64, $P = .22$)	0.50 (0.11-2.28, $P = .37$)	21 (87)	0.17 (0.04-0.70, $P = .01$)	0.20 (0.04-0.99, $P = .05$)
No	3 (6) Z	Ref		3 (12)	Ref	
Employment status						
Not employed/retired	31 (62)	0.80 (0.43-1.46, $P = .45$)	–	15 (62)	0.82 (0.35-1.93, $P = .69$)	–
Present employment	19 (38)	Ref		9 (37)	Ref	
CD4 absolute count at entry to care						
< 200 cells/mm ³	27 (56)	0.98 (0.46-2.1, $P = .41$)	–	14 (61)	1.43 (0.46-4.5, $P = .31$)	–
≥200 to <350 cells/mm ³	10 (26)	0.57 (0.23-1.43, $P = .15$)		5 (22)	0.83 (0.22-3.2, $P = .51$)	
≥350 cells/mm ³	11 (23)	Ref		4 (17)	Ref	
Patient group						
ART naïve	31 (60)	2.03 (1.12-3.68, $P = .02$)	1.67 (0.85-3.27, $P = .13$)	16 (64)	2.32 (1.01-5.46, $P = .05$)	1.87 (0.72-4.88, $P = .20$)
ART experienced	21 (40)	Ref		9 (36)	Ref	

Characteristics	52 (13%) Participants With CES-D ≥16			25 (6%) Participants With CES-D ≥21		
	N (%)	Unadjusted OR (95% CI, P Value)	Adjusted OR (95% CI, P Value)	N (%)	Unadjusted OR (95% CI, P Value)	Adjusted OR (95% CI, P Value)
Language						
English	38 (76)	0.32 (0.15-0.68, P = .003)	0.39 (0.16-0.93, P = .03)	18 (75)	0.34 (0.13-0.92, P = .03)	0.4 (.12-1.28, P = .12)
Hausa	12 (24)	Ref		6 (25)	Ref	

Abbreviations: ART, antiretroviral therapy; CES-D, Center for Epidemiological Studies Depression Scale; CI, confidence interval; OR, odds ratio; ref, reference.