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ORIGINAL ARTICLE

The pregnancy factor: the prevalence of depression among women living with HIV enrolled in the African Cohort Study (AFRICOS) by pregnancy status

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Abstract

Among Sub-Saharan African women living with HIV (WLWH), pregnancy creates unique stressors that may cause depression. We describe the prevalence of depression among WLWH enrolled in the African Cohort Study (AFRICOS) by pregnancy status and describe factors associated with depression. WLWH < 45 years of age underwent six-monthly visits with depression diagnosed using the Center for Epidemiological Studies-Depression scale. Visits were categorized as "pregnant;" "postpartum" (the first visit made after the last pregnancy visit), and "non-pregnant." The prevalence of depression was calculated for each visit type and compared using prevalence odds ratios (POR) with 95% confidence intervals (CI). Logistic regression with generalized estimating equations was used to evaluate sociodemographic factors associated with depression. From January 2013 to March 1, 2020, 1333 WLWH were enrolled, and 214 had pregnancies during follow-up. As compared to the prevalence of depression during "non-pregnant" visits (9.1%), depression was less common at "pregnant" (6.3%; POR = 0.68 [CI: 0.42, 1.09]) and "postpartum" (3.4%; POR = 0.36 [CI: 0.17, 0.76]) visits. When controlling for other factors, the visit category was not independently associated with depression. Visit number, study site, employment status, and food security were independently associated with decreased odds of depression. We observed a lower prevalence of depression during pregnancy and the postpartum period than has been previously described among WLWH during similar time points. We observed protective factors against depression which highlight the impact that holistic and consistent health care at HIV-centered clinics may have on the well-being of WLWH in AFRICOS.

Keywords HIV · Pregnancy · Depression · Women living with HIV (WLWH) · Africa · AFRICOS

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Introduction

Persons living with HIV (PLWH) experience comorbid depression at rates two to three times that of the general population (Arseniou et al. 2014; Ciesla and Roberts 2001; Nanni et al. 2015). In Sub-Saharan Africa (SSA), reliable comparative data regarding the prevalence of depression by HIV status are lacking; however, pooled estimates reveal prevalence between 9 and 32% among PLWH in SSA (Bernard et al. 2017). The negative impact that depression has on HIV disease control has been well established among PLWH in SSA and if unaddressed threatens to interrupt the efforts of global HIV elimination campaigns (Abas et al. 2014; Prince et al. 2007). Kingori and colleagues demonstrated that PLWH in Kenya with depressive symptoms had higher odds of having poor health overall as compared to PLWH who did not report such symptoms (Kingori et al. 2015). Depression has been associated with poor antiretroviral therapy (ART) adherence and poor health outcomes including poor virologic suppression, lower CD4 counts, and faster progression to AIDS (Abas et al. 2014; Ickovics et al. 2001). In 2008, the World Health Organization (WHO) launched the Mental Health Gap Action Programme (mhGAP), aimed at addressing the mental health care deficiencies among PLWH globally (WHO Guidelines Approved by the Guidelines Review Committee 2016). Although various phases of implementation have been described in the literature, the provision of mental health screening and management in the parts of the world hardest hit by the HIV pandemic remains limited (Keynejad et al. 2018; Sibeko et al. 2018).

Women living with HIV (WLWH) in SSA who become pregnant face unique stressors that put them at risk for mental illnesses, and depression is the most commonly identified (Kapetanovic et al. 2014; Mokhele et al. 2019; Sawyer et al. 2010). Reported prevalence estimates of depression among WLWH in SSA range from 22 to 85% during pregnancy or the postpartum period (Kapetanovic et al. 2014; Sowa et al. 2015). The impact of depression on HIV disease could be magnified during a pregnancy given the possibility of mother to child transmission (MTCT) of HIV. Additionally, maternal depression has been associated with other poor health outcomes for infants during the first year of life (Smith et al. 2020). In a longitudinal study of mother-infant dyads in rural South Africa, postnatal depression was associated with a cognitive delay in children at 1 year of age (Rodriguez et al. 2018). A systematic review by Dadi and colleagues showed that infants born to women with depression had substantially higher risks of adverse infant health outcomes including malnutrition and common infant illnesses as compared to infants born to women without depression (Dadi et al. 2020).

A variety of factors are thought to increase the risk of depression among WLWH in SSA. During pregnancy, WLWH often report emotions of shame, guilt, and fear and additionally experience stigma (Brittain et al. 2017). Qualitative work related to the experience of pregnant WLWH in SSA reveals narratives describing the shame women report for having become pregnant with known HIV seropositivity, which is often accentuated when these women seek prenatal care (Ashaba et al. 2017). Some women report constantly worrying about the health of their unborn child and whether they themselves will be healthy enough to be a caretaker (Ashaba et al. 2017). Additionally, because HIV testing is often a part of standardized prenatal screening, many women may learn of their status during antenatal testing, which can be stressful (Kotzé et al. 2013). Newly diagnosed WLWH are also faced with the decision of disclosing their status to their partners. Such disclosure can put women at risk for intimate partner violence, which in and of itself has been associated with depression among pregnant WLWH (Bernstein et al. 2016; Tsai et al. 2016b). Other key risk factors associated with depression among WLWH in low- and middle-income countries include socioeconomic disadvantage, unintended pregnancy, younger age, being unmarried, lacking social support, and having a history of mental health problems (Fisher et al. 2012).

Few published studies discuss the outcomes of interventions designed to improve mental health in WLWH in SSA, specifically pregnant women (Kapetanovic et al. 2014). Interventions aimed at improving coping skills, connecting WLWH to mentor mothers or support groups, and nutritional supplementation have achieved variable degrees of success (Futterman et al. 2010; Kaaya et al. 2013; Mundell et al. 2011; Smith Fawzi et al. 2007). Further understanding of risk factors for depression among WLWH in SSA who become pregnant is needed to inform the development of sustainable interventions that can be used to meet the mental health needs of this population. We describe the prevalence of depression among select, care-engaged, WLWH enrolled in the African Cohort Study (AFRICOS), by pregnancy status, and discuss demographic factors associated with depression.

Methods

Study design and participants

AFRICOS, a longitudinal cohort study designed to describe HIV disease characteristics and long-term outcomes, prospectively enrolls adults aged 18 years and older across 12 clinical care centers in Kenya, Tanzania, Uganda, and Nigeria (Ake et al. 2019; Meffert et al. 2019). As previously described, enrollment for this study began in 2013 and is ongoing.

AFRICOS is supported by the President's Emergency Plan for AIDS Relief (PEPFAR).

At the time of enrollment and every 6 months thereafter, medical history and physical exam for each participant is obtained. Additionally, participants undergo phlebotomy to evaluate HIV serostatus (if HIV negative), HIV viral load (as applicable) as well as screening for pregnancy (as applicable), sexually transmitted infections, and vector-borne diseases. Additionally, interviewer-asked behavioral and demographic data are collected, including screening for depression using the Center for Epidemiological Studies-Depression (CES-D) scale. At the time of enrollment, pregnancy is an exclusion criterion; however, if a participant becomes pregnant, while in AFRICOS, participation continues and adjustments are made with regard to the volume of blood taken during study visits for the duration of the pregnancy.

Depression screening

The CES-D scale consists of a 20-item assessment in which individuals rate how often over the previous week they experienced symptoms of depression, including sleep disturbance, decreased appetite, and loneliness. A CES-D score of ≥ 16 is used to indicate depression (Lewinsohn et al. 1997; Weissman et al. 1977). This assessment is administered to AFRICOS participants by study staff at each study visit. The response to each question is recorded on a paper case report form and subsequently imported into the research database using the ClinPlus platform (Anju Software, Tempe, AZ). Trained personnel review each data capture to ensure accuracy.

Ethics

Written, voluntary, informed consent was provided by all study participants prior to enrollment. The study protocol was approved by institutional review boards at the Walter Reed Army Institute of Research, Makerere University School of Public Health, Kenya Medical Research Institute, Tanzania National Institute of Medical Research, and the Nigerian Ministry of Defense.

Data analysis

The AFRICOS participants selected for this analysis were WLWH, enrolled between January 2013 and 1 March 2020, less than 45 years of age at any visit and had complete data for all variables included. Age less than 45 was determined based on a preliminary analysis which revealed that all of the women that became pregnant in AFRICOS were less than 45 years of age.

The demographic data at the time of enrollment included in this analysis are as follows: age, AFRICOS program site, employment status, marital status, education, provider status (*How many people do you provide for financially (including yourself)?*), and food security (*Have you had enough food to eat over the past 12 months?).* Additionally, medical data at the time of enrollment with regard to CES-D score and viral load were included. Demographic and medical data collected at the time of enrollment were compared between women never pregnant and those ever pregnant while in AFRICOS using Pearson's chi-square test for categorical variables and Wilcoxon rank-sum test for continuous variables.

We categorized each participant study visit as one of three types as follows: visit type "pregnant" refers to all study visits for which a participant was noted to be pregnant, visit type "postpartum" refers to the first study visit a participant made after the last study visit in which she was categorized as "pregnant," and visit type "non-pregnant" refers to every other study visit, including enrollment, for which participants were not categorized as "pregnant" or "postpartum." Participants could contribute multiple visits to a visit category. The prevalence of depression was calculated for each visit category based on the number of study visits with a CES-D score ≥ 16 per total number of study visits within the visit category. The prevalence of depression for each visit category was compared using prevalence odds ratios (POR) with 95% confidence intervals (95% CI).

Both unadjusted and adjusted logistic regression models with generalized estimating equations were used to calculate odds ratios (OR) and 95% CI for specific factors associated with depression in AFRICOS. For these models, enrollment visits were excluded in order to determine if depression present at the time of enrollment contributed to overall depression while in AFRICOS. All analyses were performed using SAS version 9.3 (SAS Institute, Cary, North Carolina) and Stata 15.0 (StataCorp LP, College Station, TX, USA).

Results

Study population

From January 2013 to March 1, 2020, there were 1719 WLWH enrolled in AFRICOS. Of those enrolled, 1333 met the criteria for inclusion in these analyses. There were 379 WLWH that were excluded because their age was > 45 years and seven WLWH excluded due to missing data. Among 214 (16.1%) of the WLWH included, there were 284 pregnancies recorded. At the time of enrollment, the prevalence of depression was 20.9% for all participants and this did not differ significantly between women who were ever

Table 1 Demographic and behavioral characteristics of select women living with HIV (WLWH), by pregnancy status, while in the African Cohort Study (AFRICOS)

Characteristic	All WLWH	Never pregnant during AFRICOS	Ever pregnant during AFRICOS	*p* value*
N	1333	1119	214	
Age in years (median IQR)	33.5 (28.3, 38.8)	34.7 (28.7, 39.4)	30.1 (26.6, 33.3)	**< 0.001**
Age Category				**< 0.001**
18–29 years	370 (27.8%)	287 (25.6%)	83 (38.8%)	
30–39 years	649 (48.7%)	525 (46.9%)	124 (57.9%)	
40–44 years	314 (23.6%)	307 (27.4%)	7 (3.3%)	
Program site				**< 0.001**
Kayunga, Uganda	255 (19.1%)	204 (18.2%)	51 (23.8%)	
South Rift Valley, Kenya	472 (35.4%)	413 (36.9%)	59 (27.6%)	
Kisumu West, Kenya	198 (14.9%)	153 (13.7%)	45 (21.0%)	
Mbeya, Tanzania	249 (18.7%)	227 (20.3%)	22 (10.3%)	
Abuja & Lagos, Nigeria	159 (11.9%)	122 (10.9%)	37 (17.3%)	
Currently employed				**0.022**
No	846 (63.5%)	725 (64.8%)	121 (56.5%)	
Yes	487 (36.5%)	394 (35.2%)	93 (43.5%)	
Marital status				**< 0.001**
No	681 (51.1%)	605 (54.1%)	76 (35.5%)	
Yes	652 (48.9%)	514 (45.9%)	138 (64.5%)	
Education				0.39
None or some primary	399 (29.9%)	340 (30.4%)	59 (27.6%)	
Primary or some secondary	591 (44.3%)	487 (43.5%)	104 (48.6%)	
Secondary and above	343 (25.7%)	292 (26.1%)	51 (23.8%)	
Depression at enrollment				0.97
No	1054 (79.1%)	885 (79.1%)	169 (79.0%)	
Yes	279 (20.9%)	234 (20.9%)	45 (21.0%)	
Provider status				0.46
Does not provide for anyone	131 (9.8%)	107 (9.6%)	24 (11.2%)	
Provides for ≥ 1 person	1202 (90.2%)	1012 (90.4%)	190 (88.8%)	
Enough food to eat over the past 12 months				0.29
No	447 (33.5%)	382 (34.1%)	65 (30.4%)	
Yes	886 (66.5%)	737 (65.9%)	149 (69.6%)	
Viral suppression				**0.017**
On ART, viral load < 1000 copies/mL	697 (52.3%)	598 (53.4%)	99 (46.3%)	
On ART, viral load ≥ 1000 copies/mL	145 (10.9%)	127 (11.3%)	18 (8.4%)	
Not on ART	491 (36.8%)	394 (35.2%)	97 (45.3%)	

IQR, interquartile range; *ART*, antiretroviral therapy

*Participant demographic-behavioral data at study enrollment were compared between both groups using chi-square analysis for categorical variables and Wilcoxon rank-sum test for continuous variables. *P* values < .05 are in bold text

pregnant and those never pregnant while in AFRICOS (Table 1). Women who had pregnancies while in AFRICOS tended to be younger (median age: 30.1 years versus 34.7 years, $p < 0.001$), employed (43.5% versus 35.2%, $p = 0.02$), married (64.5% versus 45.9%, $p < 0.001$), not on ART (45.3% versus 35.2%, $p = 0.02$,) and demonstrate differences with respect to program site ($p < 0.001$), as compared to women that did not have a pregnancy. Neither group differed significantly with respect to educational level, provider status, or food security.

Prevalence of depression observed across study visit category

There were 8719 study visits included in this analysis. Across all visits, including enrollment, the prevalence of

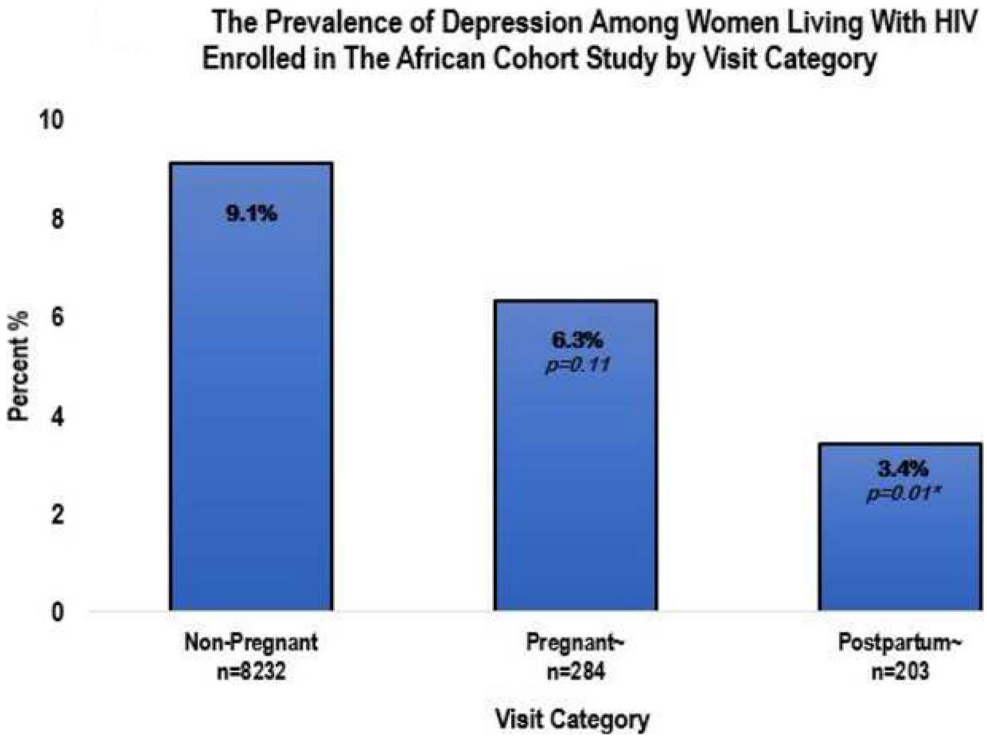

Fig. 1 The prevalence of depression among women living with HIV enrolled in The African Cohort Study by visit category. Non-pregnant: visit conducted when a participant was neither pregnant nor in the defined postpartum period. Pregnant: visit conducted while a participant was pregnant. Postpartum: The first study visit was conducted after the last pregnancy visit. ~Prevalence odds ratios were calculated using the *non-pregnant visit* types as the comparison; the asterisk "*" indicates a p value < 0.05. n is the total number of visits in the visit category

depression was 8.9% ($n = 775$ of 8719 visits) and 6.7% ($n = 496$ of 7386) when enrollment visits were excluded. As compared to the prevalence of depression during "non-pregnant" visits (9.1%; 750/8232 visits), depression was numerically less common at "pregnant" visits (6.3%; 18/284 visits; POR = 0.68 [95% CI: 0.42, 1.09], $p = 0.11$) and decreased further to a statistically significant reduction at "postpartum" visits (3.4%; 7/203 visits; POR = 0.36 [95% CI: 0.17, 0.76], $p = 0.01$) (Fig. 1).

Factors associated with depression while in AFRICOS

Unadjusted and adjusted models for factors associated with depression during AFRICOS are presented in Table 2. When controlling for other factors, visits categorized as "pregnant" (OR = 0.91, 95% CI [0.55–1.52]) or "postpartum" (OR = 0.52, 95% CI [0.24–1.11]) were not significantly associated with depression in AFRICOS. As compared to being on ART with a viral load < 1000 copies/ml, viral load ≥ 1000 copies/ml while on ART (OR = 1.41, 95% CI [1.03–1.92]) was independently associated with increased odds of depression. Depression at the time of enrollment (OR = 2.39, 95% CI [1.79–3.20]) was associated with increased odds of depression at subsequent study visits. Additionally, study visit number (OR = 0.91, 95% CI [0.87–0.95]), seeking care in South Rift Valley, Kenya, as compared to other sites (OR = 0.52, 95% CI [0.33–0.81]) being currently employed (OR = 0.66, 95% CI [0.46–0.93]), and having enough food to eat in the past 12 months (OR = 0.49, 95% CI [0.39–0.63]) were each independently associated with decreased odds of depression while in AFRICOS.

Discussion

Prevalence of depression by pregnancy status during study visit

In this analysis, we demonstrate a low prevalence of depression for study visits during which participants were pregnant or had recently given birth. We observed the lowest prevalence of depression among study visits categorized as "postpartum" as compared to visits categorized as "pregnant" or "non-pregnant." It is important to note that the majority of study visits categorized as "postpartum" do not capture the first 4 to 6 weeks following delivery, which has been used to describe the postpartum period in many settings (Heterogeneity of postpartum depression: a latent class analysis 2015). However, the WHO defines the postpartum depression risk period as the first year following delivery, which would in fact describe the vast majority of "postpartum" visits included in this analysis (Keynejad et al. 2018).

Current published studies demonstrate alarmingly high prevalence estimates of pre- and postnatal depression among WLWH, which we did not see in this analysis. In a recent meta-analysis, Zhu and colleagues reported that WLWH had nearly 2 times the odds of depression during the prenatal and postpartum period as compared to HIV-negative controls

Table 2 Unadjusted and adjusted odds ratios for select characteristics associated with depression among select women living with HIV while in the African Cohort Study

Characteristic	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Visit category		
Non-pregnant	Reference	Reference
Pregnant	0.92 (0.57–1.50)	0.91 (0.55–1.52)
Postpartum	0.49 (0.23–1.03)	0.52 (0.24–1.11)
Study visit number	**0.88 (0.84–0.92)**	**0.91 (0.87–0.95)**
Depression at enrollment		
No	Reference	Reference
Yes	**2.65 (2.00–3.50)**	**2.39 (1.79–3.20)**
Program site		
Kayunga, Uganda	Reference	Reference
South Rift Valley, Kenya	0.69 (0.47–1.01)	**0.52(0.33–0.81)**
Kisumu West, Kenya	**2.52 (1.76–3.61)**	1.30 (0.80–2.09)
Mbeya, Tanzania	**1.61 (1.10–2.37)**	1.18 (0.73–1.92)
Abuja & Lagos, Nigeria	0.78 (0.48–1.28)	0.80 (0.49–1.31)
Age category		
18–29 years	Reference	
30–39 years	0.81(0.59–1.10)	--
40–44 years	0.81(0.58–1.12)	--
Currently employed		
No	Reference	Reference
Yes	**0.60 (0.46–0.77)**	**0.66 (0.46–0.93)**
Married		
No	Reference	--
Yes	0.96 (0.76–1.23)	--
Education		
None or some primary	Reference	
Primary or some secondary	1.08 (0.81–1.44)	--
Secondary and above	0.81 (0.58–1.14)	--
Provider status		
Does not provide for anyone	Reference	--
Provides for ≥ 1 person	0.84 (0.56–1.27)	--
Enough food to eat over the past 12 months		
No	Reference	Reference
Yes	**0.36 (0.28–0.45)**	**0.49 (0.39–0.63)**
Viral suppression		
On ART, viral load < 1000 copies/mL	Reference	Reference
On ART, viral load ≥ 1000 copies/mL	**1.57 (1.16–2.14)**	**1.41 (1.03–1.92)**
Not on ART	**1.71 (1.10–2.66)**	1.31 (0.82–2.12)

CI, confidence interval

Logistic regression with generalized estimating equations was used to calculate unadjusted and adjusted odds ratios and 95% confidence intervals. The adjusted odds ratios reflect an adjusted model that included all variables that were significant on unadjusted analysis. Statistically significant risk ratios ($p < 0.05$) are in bold

(Zhu et al. 2019). Although not fully elucidated by this analysis, we suspect a variety of factors may have contributed to the low prevalence of depression observed for visits categorized as "pregnant" and "postpartum." WLWH in AFRICOS are engaged in clinical care at the time of enrollment and the large majority are receiving ART. In a prospective observational study, Turan and colleagues observed that WLWH who were on ART and linked to HIV care had the lowest levels of depression during the postpartum period (Turan et al. 2014). Next, participants in AFRICOS who are HIV seronegative undergo HIV testing routinely as part of the study protocol. As a result, HIV status, with rare exception, is

known prior to a pregnancy. Our population would have a lower likelihood of experiencing the acute depression associated with a new diagnosis of HIV concurrent with the learning of a pregnancy (Kotzé et al. 2013). Additionally, there have been very few reported cases of MTCT of HIV in AFRICOS, which plays an extremely important role in maternal emotional well-being during the postpartum period (Kapetanovic et al. 2014). Across all clinical sites, WLWH in AFRICOS receive care from personnel highly trained in the delivery of compassionate HIV care and would be unlikely to receive stigma from the medical community that contributes to acute depression among WLWH in SSA (Brittain et al. 2017).

The positive impact of pregnancy on mental health and overall well-being among WLWH in SSA should be highlighted. WLWH that become pregnant may benefit from additional support, including the provision of food during pregnancy and following delivery, when engaged in the prevention of mother to child transmission (PMTCT) programing (Tsai et al. 2016a). The large majority of our participants that became pregnant were also linked to PMTCT programming at their clinical care site. Current literature regarding family planning among WLWH in SSA suggests that many women desire to become pregnant and associate having children with happiness (Awiti Ujiji et al. 2010; Melaku et al. 2014). It is plausible that for the WLWH in AFRICOS, pregnancy represents a time of joy, which could mitigate factors that contribute to depression. In unadjusted analyses, which excluded enrollment visits, both the "pregnancy" and "postpartum" visit category approached significance with regard to decreased odds of depression in AFRICOS. Future analyses should be aimed at fully describing the experiences of WLWH in AFRICOS that become pregnant in order to truly define factors protective against depression in this key population.

Factors associated with increased odds of depression in AFRICOS

Our multivariable analysis demonstrated other key drivers associated with depression in AFRICOS when controlling for the visit category. We observed that depression at the time of enrollment was associated with the highest odds of depression even after controlling for employment status, food security, and viral suppression. For this analysis, limited data were available with regard to a participant's past mental health history due to the scarcity of such diagnoses and the variable reporting of past medical conditions among participants enrolling in AFRICOS. The presence of depression at the time of enrollment could be considered a surrogate for a prior history of depression. If this is the case, our findings are in keeping with previous analyses indicating that prior mental health diagnoses are associated with future mental health diagnoses among PLWH on ART (Bernard et al. 2017). Additionally, we observed that WLWH in AFRICOS who reported ART use but had not achieved virologic suppression and had increased odds of depression which has been previously described among PLWH in AFRICOS (Meffert et al. 2019). Poor virologic control while reporting the use of ART is a common indicator of non-compliance. If this is the case, in our population, our findings support the well-established interaction between depression and ART adherence and furthermore indicate the important role mental health services play in holistic HIV care (Uthman et al. 2014).

Factors associated with decreased odds of depression in AFRICOS

The prevalence of depression across all visit categories was 8.9% which is substantially lower than current published literature regarding the prevalence of depression among WLWH in SSA (Bernard et al. 2017). After controlling for other factors, we demonstrate that for each study visit beyond the time of enrollment, the odds of depression decreased by 9%. This observation may indicate that participation in AFRICOS with continued engagement in HIV care is likely a protective factor against depression for WLWH. Of note, a previous study arising from AFRICOS described the association between viral load and depression among 2307 male and female participants. In that analysis by Meffert et al., the prevalence of depression at the time of enrollment ranged from 18%–25%, and the female sex was associated with a higher proportion of depression than the male sex (Meffert et al. 2019). We observed a similar prevalence of depression at the time of enrollment (20.9%) among our participants. Our analysis provides insight as to how depression prevalence changes following the time of enrollment for select WLWH in AFRICOS. Further study is needed to evaluate if the prevalence of depression declines on subsequent study visits for other AFRICOS participants or if this is a feature unique to the WLWH in our analysis.

We observed other demographic factors independently associated with decreased odds of depression among WLWH in AFRICOS. The South Rift Valley (SRV) clinical sites were associated with 48% less odds of depression as compared to Kayunga, Uganda. The AFRICOS clinical sites within both regions tend to serve similar populations thus the true reason for the differences in the odds of depression is unclear. Our finding raises interest in the unique aspects of the SRV clinical sites which may positively contribute to the mental health of AFRICOS participants. Additionally, we observed that employment and having enough food to eat were both independently associated with decreased odds of depression which corroborates previously published studies that highlight the crucial role that employment and food security plays in the overall health and well-being of PLWH in SSA (Peltzer et al. 2018; Tsai et al. 2016a). Furthermore, our findings underscore the importance of continued programming aimed at the

provision of employment opportunities and food to PLWH in SSA.

Strengths/limitations

This analysis contributes to the limited body of literature regarding pregnancy and depression among WLWH in SSA, providing direction for future hypothesis-driven analyses. We present data that underscore the importance of resource allocation to provide mental health services, employment opportunities, and food for African WLHW. The use of the CES-D screening tool for depression allowed for comparison of depression across study visit types; however, a culturally validated screening tool for pregnancy and the postpartum period would be the ideal screening tool to use. Additionally, a 2016 meta-analysis suggested the CES-D screening cutoff be moved to 20 from 16 to diminish false-positive screenings (Vilagut et al. 2016). Despite using the lower threshold for our analyses, which may be expected to overestimate depression, we found a lower than expected prevalence of depression. Plausibly, since the CES-D questionnaire was interviewer led, there may have been a response bias in which, following enrollment, participants no longer accurately responded to questions. Lastly, we present data from over 1300 WLWH in AFRICOS with very few exclusions which strengthened our ability to draw meaningful conclusions among our population.

Conclusion

This study highlights a low prevalence of depression among select, care-engaged, WLWH in AFRICOS during study visits categorized as "pregnant" and "postpartum" and corroborates other known key drivers of depression among WLWH in SSA. We underscore the importance of employment, food security, and continued HIV care engagement among this population. Ensuring PLWH remain engaged in HIV care appears to be a mitigation strategy for depression and continued support of such endeavors is critical. Future analyses should focus on evaluating the experiences of WLWH in AFRICOS clinical sites in order to elucidate the key factors with regard to care engagement that lead to well-being among this group in order to inform the development of evidence-based strategies to mitigate depression in this population.

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Declarations

Ethics approval and consent to participate Written, voluntary, informed consent was provided by all study participants prior to enrollment. The study protocol was approved by institutional review boards at the Walter Reed Army Institute of Research, Makerere University School of Public Health, Kenya Medical Research Institute, Tanzania National Institute of Medical Research, and the Nigerian Ministry of Defense.

Conflict of interest The authors declare no conflict of interest.

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