Perinatal Depression in HIV-Infected African Women: A Systematic Review

Nathaniel A. Sowa, MD, PhD[a,*]; Rushina Cholera, PhD[b]; Brian W. Pence, PhD, MPH[b]; and Bradley N. Gaynes, MD, MPH[a]

ABSTRACT

Objective: To systematically review the literature on prevalence and incidence of perinatal depression in human immunodeficiency virus (HIV)–infected African women.

Data Sources: We searched 17 databases, including PubMed, PsycINFO, Cochrane, EMBASE, Web of Science, ClinicalTrials.gov, Google Scholar, and OpenGrey, from inception through August 2014 using the search strategy ((*antenatal* OR *peripartum* OR *perinatal* OR *postnatal* OR *postpartum*) AND (*depression* OR *mental disorder*) AND *HIV* AND *Africa NOT* (-) *American*).

Study Selection: We included English-language articles on studies conducted in Africa with prevalence or incidence rates of diagnostically confirmed depression or suspected depression in HIV-infected women during pregnancy through 12 months postpartum.

Data Extraction: We examined details of study design, location, means of measurement, incidence and prevalence rates of diagnostically confirmed depression or suspected depression and any associated risk factors for development of depression. Mean prevalence rates were calculated and weighted based on study size.

Results: Twenty-two articles met inclusion criteria. Two reported diagnostically confirmed antenatal depression, and 9 reported suspected antenatal depression prevalence. Two reported diagnostically confirmed postnatal depression, and 10 reported suspected postnatal depression prevalence. Weighted mean prevalence of antenatal depression was 23.4%, and suspected antenatal depression was 43.5%. Weighted mean prevalence of postnatal depression was 22.5%, and suspected postnatal depression was 31.1%. No studies reported incidence rates.

Conclusions: Few studies have examined the rate of perinatal depression in HIV-infected African women. Existing studies show a high prevalence of perinatal depression, with even higher prevalence rates of suspected depression. No data on the incidence of perinatal depression in this population exist.

J Clin Psychiatry 2015;76(10):1385–1396
dx.doi.org/10.4088/JCP.14r09186

[a]Department of Psychiatry, University of North Carolina School of Medicine, Chapel Hill

[b]Department of Epidemiology, University of North Carolina School of Public Health, Chapel Hill

**Corresponding author:* Nathaniel A. Sowa, MD, PhD, 101 Manning Drive, Campus Box 7160, Chapel Hill, NC 27514 (nathaniel_sowa@med.unc.edu).

Perinatal mood disorders are significant causes of morbidity worldwide and are the most common complication of pregnancy.[1] Recent studies of perinatal mental health have shown that the prevalence of depression during pregnancy in Western countries ranges from 8.5%–11%,[1,2] rates similar to those seen in the postnatal period (10%–15%).[1,3,4] These values are similar to the prevalence rate of major depression in the general US adult population.[5] Untreated antenatal depression is associated with poor pregnancy outcomes, including intrauterine growth restriction, low birth weight, infant behavioral difficulties, and preterm delivery.[6–8] Further, the presence of antenatal depression is a strong predictor of postnatal depression.[9] Postnatal depression develops within 1 year after birth and, if left untreated, can have severe consequences for both the infant (malnutrition, frequent illness, developmental delay, impaired mother-infant attachment, poor growth, and social interaction difficulties[10–17]) and the mother (impaired functioning, poor quality of life, and death[18]). Several risk factors have been identified for the development of antenatal depression and postnatal depression, including prior history of depression, lack of social support, recent life stressors, childhood sexual abuse, and limited partner support.[4,17–19]

Perinatal depression is especially concerning in low-income countries where there are often high pregnancy rates and minimal identification and management of depressive illness. A recent systematic review found 35 studies conducted in African countries that examined perinatal mental health.[20] Six of these studies examined depression during pregnancy, with 4 studies using diagnostic means to determine depression and 2 studies using screening tools to identify women who have high levels of depressive symptoms and who are suspected to have depression. The weighted mean prevalence of diagnostically confirmed antenatal depression was 11.6%, while the prevalence of suspected antenatal depression was 17.7%, values similar to prevalence rates seen in high-income countries.[1,2] Twenty studies examined depression in the postnatal period, with 10 studies using diagnostic means to determine postnatal depression and 10 studies using screening tools to identify suspected postnatal depression. The weighted mean prevalence of diagnostically confirmed postnatal depression was 15.0%, while the prevalence of suspected postnatal depression was 17.5%.[20] These values are slightly higher than rates seen in higher-income countries.[2] Importantly, estimates of antenatal depression and postnatal depression using screening stools are higher than rates determined using diagnostic measures for depression, suggesting studies using screening tools may overestimate prevalence rates. Variables that were consistently associated with postnatal depression included single marital status, lack of social support from family and partner, and the presence of prior depressive symptoms.

Interestingly, one variable not examined in the above studies was infection with HIV. More than 60% of those infected with HIV in the world live in sub-Saharan Africa and more than 70% of all deaths

Clinical Points

- The prevalence rates of suspected antenatal and postnatal depression in HIV-infected African women are high—42.5% and 30.7%, respectively, although few diagnostic studies exist.
- The scarcity of studies of perinatal depression in HIV-infected African women is concerning, given that identification and reduction of risk factors in this population are key to developing strategies to reduce prevalence rates.

attributable to HIV/AIDS occur in this region.[21] Women are disproportionately affected by HIV/AIDS in Africa, representing 59% of all people living with HIV in sub-Saharan Africa.[21] HIV infection is associated with an elevated prevalence of depression, as high as 36% in some studies.[22,23] Various factors contribute to this higher prevalence, including high viral load, direct effects of the virus on the immune system, symptom burden, emotional reaction to the diagnosis, and social stigma.[22,24,25] Worldwide, depression in HIV-infected individuals is associated with decreased quality of life, reduced adherence to antiretroviral medications, increased use and abuse of substances, and poor treatment outcomes, including increased utilization of services, more rapid decline in CD4 count, and increased mortality.[26–29] Few studies have been conducted on depression and HIV in Africa, although a recent systematic review showed that depression is highly associated with decreased adherence to antiretroviral therapy in several African countries.[30]

Due to the high prevalence of HIV in African women, the association between depression and HIV infection, and the effects of perinatal depression on both maternal and infant outcomes, studies examining perinatal depression in HIV-infected African women are of particular importance. Pregnancy is a critical period for entry to care for HIV infection in Africa, and the presence of depression has the potential to affect the efficacy of programs designed to improve women's health, limit transmission to future sexual partners, and limit maternal-child transmission of HIV. A recent systematic review examined the state of knowledge about mental health in HIV-infected pregnant and postpartum African women.[31] It identified 12 pertinent studies and briefly reviewed the qualitative results. Conclusions from the review included that a new diagnosis of HIV during pregnancy may increase the risk of depression, postpartum depression may predict perceived HIV-related stigma, and data on whether HIV is a risk factor for perinatal depression are inconclusive. The review also identified 3 intervention studies that showed marginal benefit in treating perinatal depression in HIV-infected women.[31]

While this study provided an important qualitative review of the literature, it did not conduct any quantitative analysis of perinatal depression in this population. This information is important in understanding the scope of the problem and identifying where interventions may be needed. Therefore, the goal of this article is to systematically review the prevalence and incidence of antenatal depression and postnatal depression in HIV-infected women in Africa, as well as the effects of antenatal depression and postnatal depression on the treatment and progression of HIV/AIDS in this population. For this review, we focus on studies conducted on the continent of Africa. We recognize that many HIV-infected women originally from Africa are currently living as immigrants or refugees in other countries, and while they suffer from perinatal depression at high rates, they have been the subject of another recent review[32] and will not be included here.

METHOD

Search Strategy

We systematically searched for studies conducted on the continent of Africa focusing on antenatal depression and postnatal depression in HIV-infected women. The computerized databases of PubMed, African Index Medicus, PsycINFO, PsycARTICLES, Scopus, Cochrane, Trip, EBSCOhost Global Health, Embase, ISI Web of Science, CINAHL, ClinicalTrials.gov, and Google Scholar were searched for studies published from earliest entry date in the database through August 2014. In an attempt to identify gray literature, searches were also conducted using ProQuest dissertation database, The New York Academy of Medicine database, OpenGrey, and EBSCOhost Newspaper Source Plus. We used the search strategy ((*antenatal* OR *peripartum* OR *perinatal* OR *postnatal* OR *postpartum*) AND (*depression* OR *mental disorder*) AND *HIV* AND *Africa NOT* (-) *American*) in each database and hand-searched in reference sections of relevant articles.

Study Eligibility

Inclusion criteria required that studies be in English, examine point prevalence or incidence estimates of diagnostically confirmed depression or suspected depression in pregnant or postpartum women (up to 12 months postpartum), reported data on HIV-infected women, and be conducted on the African continent. *Suspected depression* was defined as cases screening positive for depression on a measurement tool, but not confirmed using a diagnostic measure. Studies not meeting any of these criteria were excluded. We placed no limits on the size, duration, or design of the study.

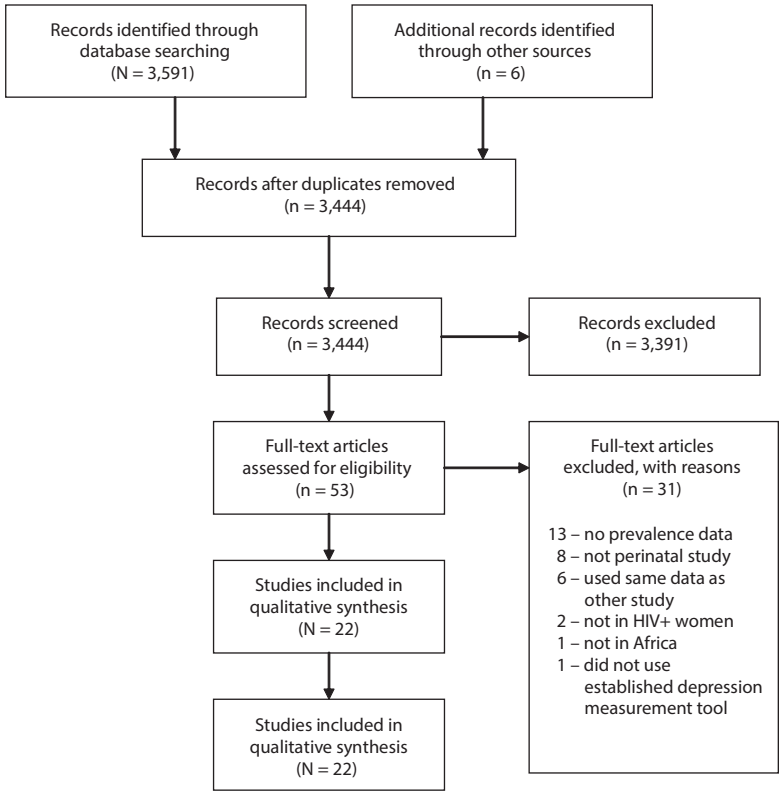
Review Process and Data Extraction

Two independent reviewers (N.A.S. and R.C.) conducted the literature search, study review, and data extraction. The titles of all studies identified as a result of our search strategy were examined, and studies that clearly did not pertain to our topic of interest were eliminated. Studies that were deemed potentially pertinent based on their titles had their abstracts examined. Studies clearly not meeting our inclusion criteria based on their abstracts were eliminated from further review. The full text articles of the remaining studies were examined for inclusion, and data extraction was conducted

if deemed appropriate. Discrepancies between the 2 independent reviewers were discussed with the senior study authors, and a consensus on inclusion or exclusion was met among all authors.

From included studies, we extracted the study location, number of participants, time frame of measurement, measurement tool used to determine depression or suspected depression, the percentage of individuals who were HIV-infected at the time of measurement, the prevalence or incidence rates of depression or suspected depression, and risk factors for development of depression. If eligible studies did not provide data in a form we were able to access, we attempted to contact the corresponding authors of these studies. For the purpose of this review, we included studies that used diagnostic means to identify antenatal depression or postnatal depression, as well as studies that used screening tools to detect suspected antenatal depression or postnatal depression that was not confirmed by a diagnostic test. We determined weighted mean prevalence rates of diagnostically confirmed antenatal depression and postnatal depression, as well as weighted mean prevalence rates of suspected antenatal depression and postnatal depression from studies using only screening tools. We also determined an overall weighted mean prevalence by combining results from both diagnostic and screening studies.

Figure 1. PRISMA Flow Diagram[a]



[a]Diagram of the systematic review of studies on the prevalence and incidence of perinatal depression in HIV-infected African women.
Abbreviations: HIV = human immunodeficiency virus, HIV+ = HIV-infected, PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses (prisma-statement.org).

Quality Assessment

The quality of each study was assessed using a checklist that was initially developed by Mirza and Jenkins[33] and that was modified slightly by Fisher et al.[34] We further modified the checklist to add a tenth item, the disclosure of potential conflict of interests. On the basis of this scoring system, a score of 0–4 is considered low or poor quality, 5–7 is considered moderate quality, and 8–10 is considered high or good quality.

Analysis

Mean prevalence values were weighted based on the number of subjects in each study, and 95% confidence intervals were calculated. Pearson χ^2 test was done to assess if observed prevalence values were different based on various comparisons.

RESULTS

After removing duplicates, we identified 3,444 unique articles (Figure 1). Review of titles eliminated 3,391 records from further review, leaving 53 records that were examined more closely for full-text review. Of these 53 records, 31 were eliminated from further evaluation because they did not meet all inclusion criteria. Three studies listed odds ratios for antenatal depression and postnatal depression, but did not give prevalence or incidence rates or provide the data necessary to calculate these rates. Authors of 2 of the studies responded to our request for prevalence rates prior to publication, and these data were included in the analysis.[35,36] As a result, 22 studies met the inclusion criteria. Ten studies[36–45] examined the antenatal period alone, 11 studies[35,46–55] examined the postnatal period only, and 1 study[56] examined both the antenatal and postnatal periods (Table 1). The study that examined both the antenatal and postnatal periods did not report incidence, and it is not clear from the study if depression in the postnatal period represented new episodes of depression or if they were a continuation of depressive episodes from pregnancy. One study[50] that examined the postnatal period gave suspected depression prevalence data at 2 different time points after birth, but only 1 time point was used for further analysis. One study[54] reported incident suspected depression in the postnatal period, but did not specify incident suspected depression specifically in HIV-infected women. Two of the studies[40,42] that examined the antenatal period used diagnostic tools to determine antenatal depression, while remaining studies used screening tools to identify individuals with suspected antenatal depression. Two of the studies[46,47] that examined the postnatal period used diagnostic tools to

Table 1. Studies of Antenatal and Postnatal Depression and Suspected Depression in HIV-Infected African Women (continued)

Study	Country and Location	N	Type of Study	Time of Assessment	Instrument and Cutoff	HIV+	HIV–	Prevalence of Depression in HIV+	Quality[a]
Antenatal									
Antelman et al[37]	Tanzania Urban Antenatal clinics	891	Secondary analysis from RCT	Unknown	HSCL-8 > 1.06	All		42.7%	6
Collin et al[56]	Zambia Urban 1 antenatal clinic	181	Cross-sectional	34 wk	SRQ-20 ≥ 7	89 (49.2%)	92 (50.8%)	22.8% HIV+ 21.8% HIV–	7
Futterman et al[38]	South Africa Urban 1 obstetric unit at hospital, 1 at community health center	71	Case-control study	24.5 wk mean	CES-D ≥ 16	All		25.4%	6
Kaaya et al[40]	Tanzania Urban 4 antenatal clinics at hospitals	99	Secondary analysis from RCT	< 27 wk	SCID	All		7.7%	4
Kaaya et al[39]	Tanzania Urban 5 antenatal clinics at hospitals	188	RCT	< 27 wk	HSCL-15 > 1.06	All		73.4%	7
Manikkam and Burns[41]	South Africa Urban Antenatal clinic at tertiary hospital	378	Cross-sectional	28.6 wk mean	EPDS ≥ 13	104 (27.6%)	201 (53.2%); 73 (19.3%) unknown	42.0% HIV+ 33.0% HIV– 45.0% HIV unknown	6
Mundell et al[36]	South Africa Urban 4 antenatal clinics	249	Cross-sectional	9 mo	CES-D ≥ 16	All		49.6%	6
Rochat et al[42]	South Africa Rural 1 large primary health care facility	109	Cross-sectional	2nd half of pregnancy	SCID	49 (45%)	60 (55.0%)	55.0% HIV+ 40.0% HIV–	7
Smith Fawzi et al[43]	Tanzania Urban Several clinics	912	One time point of RCT	20–40 wk	HSCL-8 > 1.06	All		42.4%	4
Stranix-Chibanda et al[44]	Zimbabwe Peri-urban 3 antenatal clinics	274	Cross-sectional	3rd trimester	SSQ ≥ 8	62 (22.6%)	212 (77.4%)	19.4% HIV+ 16.5% HIV–	5
Tomlinson et al[45]	South Africa Urban Community sample	1,126	Cross-sectional	25.9 wk mean	EPDS ≥ 13	330 (29.3%)	796 (70.7%)	41.0% HIV+ 35.0% HIV–	9
Postnatal									
Chersich et al[46]	Kenya Urban 1 pediatric clinic in provincial hospital	500	Cross-sectional	up to 1 y	*ICD-10* depression inventory	54 (10.8%)	446 (89.2%)	4.0% HIV+ 1.4% HIV–	7
Chibanda et al[47]	Zimbabwe Peri-urban 2 postnatal clinics	210	Cross-sectional	6–8 wk	SCID	31 (14.8%)	148 (70.5%); 31 (14.8%) unknown	54.8% HIV+ 24.0% HIV– 35.5% HIV unknown	7
Collin et al[56]	Zambia Urban 1 antenatal clinic	181	Cross-sectional	7 d and 6 wk	SRQ-20 ≥ 7	89 (49.2%)	92 (50.8%)	7 d post: 4.5% HIV+ 6.4% HIV– 6 wk post: 3.5% HIV+ 5.0% HIV–	7

(continued)

It is illegal to post this copyrighted PDF on any website.

Table 1 (continued). Studies of Antenatal and Postnatal Depression and Suspected Depression in HIV-Infected African Women

Study	Country and Location	N	Type of Study	Time of Assessment	Instrument and Cutoff	HIV+	HIV–	Prevalence of Depression in HIV+	Quality[a]
Cuca et al[35]	Kenya Rural 9 clinics	441	Section of longitudinal study	Postnatal	EPDS ≥ 13	164 (37.2%)	277 (62.8%)	22.6% HIV+	6
Cyimana et al[48]	Zambia Urban University teaching tertiary hospital	229	Cross-sectional	2–6 wk	EPDS ≥ 13	46 (19.9%)	183 (79.2%)	37.0% HIV+ 26.0% HIV–	7
Dow et al[54]	Malawi Urban primary clinic and peri-urban clinic	492	Longitudinal	10–14 wk	EPDS ≥ 12	338 (68.7%)	154 (31.3%)	11.5% HIV+ 9.7% HIV-	7
Hartley et al[49]	South Africa Rural Children's hospital research unit	83	Cross-sectional	10–12 mo	EPDS ≥ 12	All		42.2% (35)	5
Nöthling et al[55]	South Africa Urban Community health centers	70	Timepoint in longitudinal study	12 mo	CES-D ≥ 16	All		50.0% (35)	7
Okronipa et al[50]	Ghana Rural 3 prenatal clinics	492	Cross-sectional	6 mo	EPDS ≥ 13	152 (30.8%)	176 (35.7%); 164 (33.3%) unknown	17.0% HIV+ 3.0% HIV– 10.0% HIV unknown	6
Peltzer and Shikwane[51]	South Africa Rural 48 primary care clinics and community health centers	607	Cross-sectional	Up to 1 y	EPDS ≥ 14	All		45.1%	7
Stewart et al[52]	Malawi Rural Child health clinic at government hospital	501	Cross-sectional	9.9 mo mean	SRQ-20 ≥ 8	57 (18.2%)	257 (51.3%); 187 (37.3%) unknown	43.9% HIV+ 35.3% HIV–	8
Uriyo et al[53]	Tanzania Rural 50 communities (home visits)	1,922	Cross-sectional	0–36 mo	SSQ	73 (3.8%)	1,849 (96.2%)	42.5% HIV+ 28.2% HIV–	10

[a]Quality: score 0–4 = low or poor quality, 5–7 = moderate quality, and 8–10 = high or good quality.
Abbreviations: CES-D = Center for Epidemiologic Surveys for Depression, EPDS = Edinburgh Postnatal Depression Scale, HIV+ = HIV-infected, HIV– = HIV-negative, HSCL = Hopkins Symptoms Checklist, N = sample size, RCT = randomized controlled trial, SCID = Structured Clinical Interview for Depression, SRQ-20 = Self-Reporting Questionnaire, SSQ = Shona Symptom Questionnaire.

determine postnatal depression, while the remaining studies used screening tools to identify individuals with suspected postnatal depression.

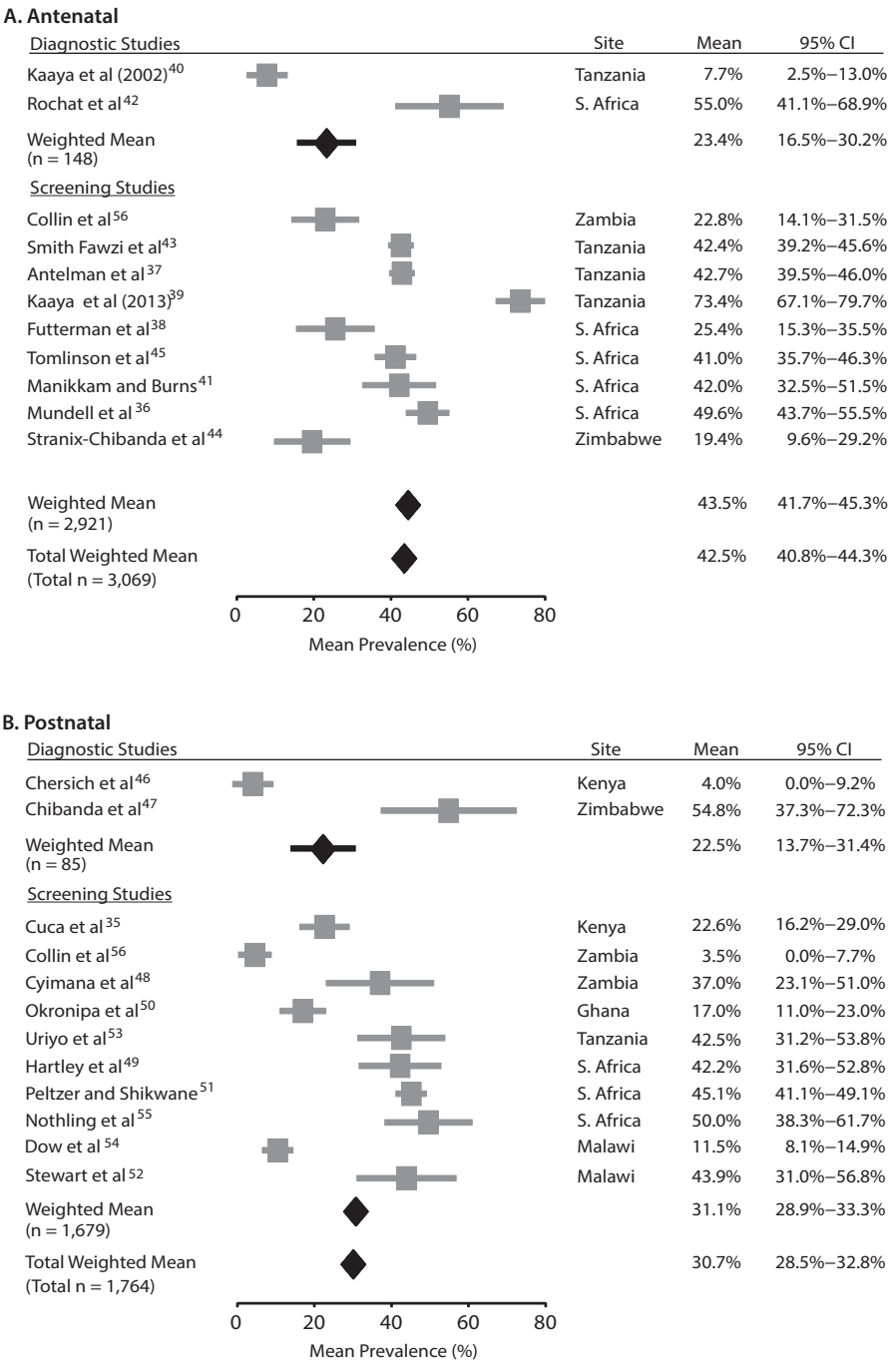
Estimation of Perinatal Depression

Two different diagnostic tools were used to diagnose perinatal depression. One study[46] used the *ICD-10* depression inventory (Major Depression Inventory[57]), a self-report questionnaire that is designed to specifically diagnose and determine the severity of depression. Three studies[40,42,47] used the diagnostic Structured Clinical Interview for *DSM-IV* Axis I Disorders (SCID) directly. Five questionnaires that query depressive symptoms and are not direct diagnostic measures were used to identify individuals with suspected depression: the Edinburgh Postnatal Depression Scale (EPDS), subsets of the Hopkins Symptoms Checklist (HSCL-8, HSCL-15), the Self-Reporting Questionnaire (SRQ-20), the Shona Symptom Questionnaire (SSQ), and the Centre for Epidemiologic Surveys for Depression (CES-D). All of the measures have been validated in African populations, although only the EPDS and SRQ-20 have been validated in antenatal and postnatal African populations.[40,42,45,54,58–65] The HSCL-15 and HSCL-8 have been validated in an antenatal population in Tanzania, but not in postnatal African populations.[40] The SSQ and CES-D have been validated only in general adult African populations[62,63] and have not been validated in the perinatal period.

Prevalence During Pregnancy

Two studies[40,42] assessed the prevalence of antenatal depression using diagnostic measures in HIV-infected women. The individual study characteristics and prevalence rates are detailed in Table 1, and a summary of prevalence is shown in Figure 2. Both studies used the SCID to diagnose depression. One study[40] was a secondary analysis from a randomized controlled trial conducted in an urban center in Tanzania and found a relatively low prevalence rate, while the other study[42] was a cross-sectional study conducted in a rural primary health care facility in South Africa and showed a relatively high prevalence. The combined

Figure 2. Studies of Perinatal Depression and Suspected Perinatal Depression in HIV-Infected African Women[a]



[a]Summary of the individual studies that report the prevalence of suspected antenatal and postnatal depression in HIV-infected African women. Values are mean prevalence ± 95% confidence interval (CI). Means for antenatal and postnatal depression, suspected antenatal and postnatal depression, and total prevalence rates were weighted by the number of subjects in each study.
Abbreviation: HIV = human immunodeficiency virus.

weighted mean prevalence rate from these studies was 23.4% (95% CI, 16.5%–30.2%).

Nine studies[36–39,41,43–45,56] assessed the prevalence of individuals at high risk of antenatal depression using screening tools, including the HSCL, EPDS, CES-D, SRQ-20, and SSQ. As shown in Table 1, these studies were conducted in 4 different countries, recruited patients mostly from urban populations and antenatal clinics, and were predominantly cross-sectional in nature. The weighted mean prevalence from these studies was 43.5% (95% CI, 41.7%–45.3%). The weighted mean prevalence in studies using diagnostic measures (n = 2 studies) was significantly lower than the weighted mean prevalence in studies using screening measures (n = 9 studies) ($\chi^2 = 22.7$, $P < .0001$; Table 2A). Combining data from all 11 studies gives an overall weighted mean prevalence value for the estimation of antenatal depression of 42.5% (95% CI, 40.8%–44.3%).

The overall quality of the studies was moderate, with only 8 studies having a quality score > 5 (Table 1). The most common limitations were inadequate sample size or justification of sample size, a discussion of whether the sample was representative of the population, absence of clear inclusion or exclusion criteria, or the absence of a conflict of interest statement (Table 3). Only 3 studies[36,38,45] discussed in their methods how the population studied was representative of the population in general within the region examined. There were no obvious differences in prevalence rates based on the setting of study, country of study, type of study conducted, measurement tool used, or quality of study, although due to the limited number of studies found, more in-depth statistical analyses were not performed.

Five of the studies[41,42,44,45,56] examined the prevalence of depressive symptoms in both HIV-infected and HIV-negative women in their populations, while 6[36,37–40,43] examined only HIV-infected women. In studies that looked at both HIV-infected and HIV-negative women, 1 study[41] reported a significant association between HIV-infected status and risk of suspected antenatal depression, while 3 studies[42,45,56] showed no significant association (Table 2C). Overall, there was a slightly higher prevalence of suspected antenatal depression in HIV-infected women (37.6% vs 31.2%, $\chi^2 = 4.0$, $P = .046$; Table 2B). Prevalence of suspected antenatal depression in HIV-infected women was slightly higher in studies that examined HIV-infected populations

Table 2. Prevalence of Perinatal Depression and Suspected Perinatal Depression in HIV-Infected African Women

	Total N (no. of studies)	Prevalence Range	Weighted Mean Prevalence	95% CI
A. Total weighted mean prevalence[a]				
Antenatal				
Screening	2,921 (9)	19.4%–73.4%	43.5%	41.7%–45.3%
Diagnostic	148 (2)	7.7%–55.0%	23.4%	16.5%–30.2%
Postnatal				
Screening	1,679 (10)	3.5%–50.0%	31.1%	28.9%–33.3%
Diagnostic	85 (2)	4.0%–54.8%	22.5%	13.7%–31.4%
B. Mean prevalence of suspected perinatal depression[b]				
Antenatal				
General population				
HIV-infected	875 (5)	19.4%–55.0%	37.6%	34.4%–40.8%
HIV-negative	1,361 (5)	16.5%–40.0%	31.2%	28.7%–33.6%
HIV-infected population only	2,435 (6)	7.7%–73.4%	43.8%	41.8%–45.8%
Postnatal				
General population				
HIV-infected	1,081 (9)	3.5%–54.8%	16.6%	14.4%–18.8%
HIV-negative	3,469 (9)	1.4%–35.3%	22.0%	20.6%–23.4%
HIV-infected population only	760 (3)	42.2%–50.0%	45.2%	41.7%–48.8%

Study	Positive Association, OR (95% CI)	No Association, OR (95% CI)
C. Summary of studies that examine the relationship between HIV and perinatal depression[c]		
Antenatal		
Collin et al[56]		No OR given
Manikkam and Burns[41]	1.6 (0.9–2.5)	
Rochat et al[42]		1.84 (0.86–3.95)
Tomlinson et al[45]		No OR given ($P = .07$)
Postnatal		
Chersich et al[46]		2.80 (0.55–14.17)
Chibanda et al[47]		1.95 (0.76–4.99)
Collin et al[56]		No OR given
Cyimana et al[48]		1.77 (0.68–4.61)
Dow et al[54]		1.18 (0.68–2.08)
Okronipa et al[50]	No OR given ($P = .0006$)	
Uriyo et al[53]		1.40 (0.83–2.37)

[a]Total weighted mean prevalence of suspected antenatal and postnatal depression ("Screening") and diagnostically confirmed antenatal and postnatal depression ("Diagnostic") in HIV-infected African women.
[b]Mean prevalence of suspected antenatal and postnatal depression in HIV-infected and HIV-African women shown from studies that examine suspected depression prevalence in a general population compared to suspected antenatal and postnatal depression prevalence in studies that examined HIV-infected women only ("HIV-infected population only"). Mean prevalence values are weighted based on number of subjects.
[c]Summary of studies that examine if infection with HIV is associated with suspected antenatal or postnatal depression. Data are given as odds ratios (ORs) and 95% confidence intervals (CIs).
Abbreviation: HIV = human immunodeficiency virus, N = sample size.

only compared to studies that examined both HIV-infected and HIV-negative women (43.8% vs 37.6%, $\chi^2 = 74.4$, $P < .0001$; Table 2B). None of the studies examined risk or protective factors for the development of depression in HIV-infected pregnant women.

Prevalence in the Postnatal Period

Two cross-sectional studies[46,47] assessed the prevalence of postnatal depression using diagnostic measures in HIV-infected women. The individual study characteristics and prevalence rates are detailed in Table 1 and a summary of overall prevalence is shown in Figure 2. One study[46] used the *ICD-10* to diagnose depression in an urban population in Kenya and found a relatively low prevalence rate, while the other study[47] used the SCID to diagnose depression in a peri-urban population in Zimbabwe and found a relatively high prevalence. The combined weighted mean prevalence rate from these studies was 22.5% (95% CI, 13.7%–31.4%).

Ten studies[35,48–56] assessed the prevalence of individuals at high risk of postnatal depression using screening tools, including the EPDS, SRQ-20, and SSQ. As shown in Table 1, these studies were conducted in 6 different countries, recruited patients mostly from urban populations and antenatal clinics, and were predominantly cross-sectional in nature. The weighted mean prevalence of suspected postnatal depression from these studies was 31.1% (95% CI, 28.9%–33.3%). The weighted mean prevalence of postnatal depression in studies using diagnostic measures (n = 2 studies) was slightly lower than the weighted mean prevalence of suspected postnatal depression in studies using screening measures (n = 10 studies), but this difference did not reach statistical significance ($\chi^2 = 2.90$, $P = .09$; Table 2A). Combining data from all 12 studies gives an overall weighted mean prevalence value for the estimation of postnatal depression of 30.7% (95% CI, 28.5%–32.8%).

Table 3. Quality of Studies of Perinatal Depression in HIV-Infected African Women[a]

Study	Clear Study Aims	Sample Size	Representative Sample	Inclusion and Exclusion Criteria	Measure of Mental Health	Response Rate and Losses	Adequate Description of Data	Statistical Analysis	Informed Consent	Conflict of Interest Statement	Total Score
Antelman et al[37]	1	1	0	0	1	1	1	1	0	0	6
Chersich et al[46]	1	1	0	0	1	1	1	1	1	0	7
Chibanda et al[47]	1	0	0	1	1	0	1	1	1	1	7
Collin et al[56]	1	1	0	1	1	1	1	1	0	0	7
Cuca et al[35]	1	0	0	1	1	0	1	1	1	0	6
Cyimana et al[48]	1	1	0	1	1	0	1	1	1	0	7
Dow et al[54]	1	0	0	1	1	0	1	1	1	1	7
Futterman et al[38]	1	0	1	0	1	0	1	1	1	0	6
Hartley et al[49]	1	0	0	0	1	0	1	1	1	0	5
Kaaya et al (2002)[40]	1	0	0	0	1	0	1	1	0	0	4
Kaaya et al (2013)[39]	1	0	0	1	1	1	1	1	1	0	7
Manikkam and Burns[41]	1	1	0	0	1	0	1	1	0	1	6
Mundell et al[36]	1	0	1	0	1	1	1	1	0	0	6
Nöthling et al[55]	1	0	0	1	1	0	1	1	1	1	7
Okronipa et al[50]	1	0	0	1	1	1	1	1	0	0	6
Peltzer and Shikwane[51]	1	0	0	1	1	1	1	1	1	0	7
Rochat et al[42]	1	0	0	1	1	1	1	1	1	0	7
Smith Fawzi et al[43]	1	0	0	0	1	0	1	1	0	0	4
Stewart et al[52]	1	0	0	1	1	1	1	1	1	1	8
Stranix-Chibanda et al[44]	1	0	0	0	1	0	1	1	1	0	5
Tomlinson et al[45]	1	0	1	1	1	1	1	1	1	0	9
Uriyo et al[53]	1	1	1	1	1	1	1	1	1	1	10

[a]Score 0–4 = low or poor quality, 5–7 = moderate quality, and 8–10 = high or good quality.

The overall quality of the studies was moderate-to-high, with all studies having a quality score ≥ 5, and one study[53] that scored 10 (Table 1). The most common limitations were inadequate sample size or justification of sample size, a discussion of whether the sample was representative of the population, and the absence of a conflict of interest statement (Table 3). There were no apparent differences in prevalence rates based on the setting of study, country of study, type of study conducted, measurement tool used, or quality. However, the number of studies was too small to do further meaningful statistical analysis.

Nine of the studies[35,46–48,50,52–54,56] examined the prevalence of suspected depression in both HIV-infected and HIV-negative women in their populations, while 3[49,51,55] examined only HIV-infected women. One study[50] reported a significant association between HIV-infected status and risk of suspected postnatal depression (no odds ratio was given), while 6[46–48,53,54,56] showed no significant association (Table 2C). However, all 6 of those studies showed a non–statistically significant trend toward a positive association. HIV-infected women had a slightly lower prevalence of suspected postnatal depression compared to HIV-negative women (16.6% vs 22.0%, $\chi^2 = 14.8$, $P = .0001$, Table 2B). Similar to the antenatal studies, the prevalence of suspected postnatal depression in HIV-infected women was higher in studies that examined HIV-infected populations only compared to studies that examined both HIV-infected and HIV-negative women (45.2% vs 16.6%, $\chi^2 = 180.8$, $P < .0001$; Table 2B). Only one study[51] examined risk or protective factors for the development of depression in HIV-infected pregnant women and found that having had a sexually transmitted infection (STI; other than HIV) in the preceding 12 months, high discrimination experiences score, high internalized stigma score, and low social support score were significantly associated with depressed mood in HIV-infected postpartum women.

Effect of Suspected Depression on HIV Disease Progression

One study[22] examined the effect of suspected depression on the progression of HIV. This study followed HIV-infected women for up to 6–8 years after giving birth and found that having suspected depression (as determined by EPDS) was associated with a greater than 60% increased risk of having or progressing to World Health Organization clinical stage III/IV disease (hazard ratio [HR] = 1.61; 95% CI, 1.28–2.03). Suspected depression was also associated with a greater than 2-fold significant increased risk of death in these women (HR = 2.65; 95% CI, 1.89–3.71). However, it is not clear from the study if these were results in women having suspected depression at any time during the 6- to 8-year follow-up period, or if the results were in women having suspected depression at baseline (birth of their child).

Effect of Suspected Depression on Adherence to Antiretroviral Treatment

One study[66] examined the effect of suspected depression on adherence to antiretroviral treatment, assessing adherence to short-course antiretroviral prophylaxis for the prevention of mother-to-child transmission in a population of HIV-infected mothers in South Africa. It did not report the prevalence of suspected depression in this population, and was not included in the prevalence analysis. A total of 6.7% of antenatal HIV-infected women and 23.1% of postnatal HIV-infected women reported missing azidothymidine doses because they felt too depressed. However, in multivariate analysis, there was no correlation between depression score and adherence to antiretroviral therapy.

DISCUSSION

Recently, there have been published reviews on the prevalence of perinatal mental disorders in the general African population[20] and on the state of knowledge of mental health in HIV-infected pregnant African women.[31] While these reviews identified articles that examine general issues related to mental health in HIV-infected pregnant and postpartum African women, our systematic review identifies several additional studies and is the first to conduct quantitative analysis specifically of perinatal depression in this population.

The weighted mean prevalence rates of antenatal depression and postnatal depression from studies that used only diagnostic tools were substantial, particularly compared to rates seen in the general HIV-negative African population. These rates are also much higher than rates of antenatal depression (10%) and postnatal depression (13%) in the general population in high-income countries,[67] but are similar to those of perinatal depression in HIV-infected women in high-income countries (antenatal depression, 30.8%–34.0%; postnatal depression, 18.3%–31.0%).[29,68] These findings suggest that pregnant and postpartum women who are HIV-infected may be at especially high risk of developing perinatal depressive illness regardless of socioeconomic setting. Indeed, a higher rate of postnatal depression has also been seen in HIV-infected African women who are living in high-income countries as refugees or immigrants.[32]

Interestingly, our search found 1 study each for antenatal depression and postnatal depression that showed a very low prevalence using a diagnostic measure,[40,46] along with 1 study each for antenatal depression and postnatal depression that showed a relatively high prevalence using diagnostic measures.[42,47] Both studies that found low prevalence rates were conducted in urban settings in clinics associated with large hospitals, while both studies that found higher prevalence rates were conducted in rural or peri-urban clinics, suggesting there may be a difference in prevalence based on study location or specific population studied.

Importantly, very few studies used diagnostic means to determine antenatal depression and postnatal depression, and the rates observed in these studies varied greatly, making it difficult to determine from these studies alone how close our calculated mean prevalence values are to the actual prevalence in this population. A much larger group of studies used screening tools to identify individuals with suspected depression based on established cut-offs for these tools. Including these studies resulted in higher estimated rates of suspected antenatal depression and postnatal depression. A key consideration is that the use of screening tools may result in several false positives, and thus may inflate estimates of depression. Also, not all of these tools have been validated against standard diagnostic measurements of depression in the populations studied. As a result, depression prevalence may be overestimated by measurement tools that have not been validated for a given population due to differences in language or cultural interpretation. Further, measurement tools that place more emphasis on somatic symptoms may overestimate depression rates in pregnant and HIV-infected populations. Finally, with the exception of the SSQ, all of the screening tools used in these studies were originally developed for use in European or North American populations, with only minor adaptations for use in African settings. The use of such Western-derived instruments may not be valid in other settings, as mental illness constructs may not be universal.[69] A recent meta-analysis[70] identified only 3 studies assessing the reliability and validity of perinatal depression instruments developed specifically in a given cultural setting in Africa. While some suggest these instruments may be more valid screening tools, the only study[71] that compared 1 of these instruments to the EPDS and HSCL showed only slightly greater reliability. Thus, screening tools constructed in a culturally contextual way may be more accurate, but further research is needed to determine this.

Accordingly, the true rates of perinatal depression as defined by clear diagnostic criteria may be lower than the combined estimates of suspected antenatal depression and postnatal depression that include studies using screening tools. However, a recent review of perinatal mood disorders in low- and lower-middle–income countries suggested that the overall prevalence estimates of depression were not consistently different when looking at studies using self-reported symptom measures versus those using diagnostic assessments.[34] Thus, it is possible that by including more studies that used screening tools, the overall estimate of suspected antenatal depression and postnatal depression may be closer to the true prevalence values in the population. However, without further high-quality studies that use diagnostic measures to determine antenatal depression and postnatal depression in HIV-infected African women, it will be difficult to determine actual prevalence values. Despite the current limitations of the literature due to the low number of diagnostic studies, our findings suggest that at a minimum, approximately 1 woman of every 5 pregnant or postnatal HIV-infected African women has antenatal depression or postnatal depression, with approximately 2 of every 5 having elevated depressive symptoms. Both estimates are unsettlingly high proportions of the population.

As recently described, many women in low- and lower-middle–income countries lack access to antenatal care or make fewer than the recommended number of visits.[34] In settings where many women live in rural areas and few attend antenatal or postnatal care, the least representative samples are likely to be those from tertiary care hospitals in urban areas. The most representative samples are those that come from community health services, especially those located in rural areas where most women may receive care. In our review, only 1 study of antenatal depression[42] and 4 studies of postnatal depression[35,50,51,53] were conducted in rural settings in either primary health clinics or community samples. Of these, only 1 study[53] of postnatal depression was very large in size and high in quality and was the only study that described its population as being representative of the

general population. As such, it is the study that examined the "most representative" population and had a higher prevalence than the weighted mean. It is thus possible that large, high-quality studies of most representative populations may show a true prevalence that is higher than that estimated from this review, although further research is needed to determine this.

We found that prevalence estimates for suspected depression in HIV-infected women were generally higher in studies that examined only HIV-infected women compared to studies that included both HIV-infected and HIV-negative women. This suggests there may be methodological differences between these 2 types of studies. Studies that examined only HIV-infected women may have somehow enriched for depressed patients as opposed to studies that included all women regardless of HIV status. Study populations recruited from HIV clinics may show selection bias, such that those women who are more likely to enroll in clinical studies are more prone to psychopathology. Regardless of the etiology of this phenomenon, future studies that examine perinatal depression should be aware that prevalence estimates may be inflated if only HIV-infected individuals are included.

Our search revealed there are currently no longitudinal studies that have examined the incidence of depression specifically in HIV-infected women during pregnancy or in the postnatal period. One study[54] did look at incident suspected postnatal depression in both HIV-infected and HIV-negative women, but did not report the data separately for HIV-infected women. The overall incidence of suspected postnatal depression was 5.6% at 6 months postpartum, 6.4% at 9 months, and 2.7% at 12 months, suggesting continued incident suspected depression in the postnatal period, although it is unclear what the rates are in HIV-infected women specifically. All other studies identified in our search presented estimated prevalence at specific time points. Prospective studies are generally more stringent in nature and would be more useful in determining if HIV-infected African women develop depression at rates similar to those of African women without HIV or women in high-income countries. If there is a higher rate of incident depression in HIV-infected African women, closer surveillance of these women during pregnancy would be warranted for more effective treatment of depression and prevention of potential adverse outcomes in pregnancy. Thus, prospective studies using diagnostic criteria are needed to address this important question in order to best allocate resources.

Our review also highlights the limited state of knowledge regarding the effects of perinatal depression on maternal morbidity and mortality in HIV-infected African women and children. We identified only 1 study[37] that looked at the role of suspected depression on HIV outcomes, and this study specifically excluded depression during the first year postpartum, making it impossible to know the long-term effects of traditionally defined postnatal depression in this population. However, the results show a greater rate of progression of HIV and a higher mortality rate in patients with suspected depression, providing further evidence for worsening outcomes in HIV-infected women with comorbid depression. Only 1 study[66] has looked at short-term adherence to antiretroviral medication in perinatally depressed African women. As a recent systematic review has shown that adherence to highly active antiretroviral therapy (HAART) is affected by depression in African populations, this is an important area to investigate in the perinatal period.[30]

Little is known regarding other risk factors that are associated with the prevalence of perinatal depression in HIV-infected African women. We identified only 1 study[51] that examined these associations, which found that having had a sexually transmitted infection (other than HIV) in the past 12 months, having a high sense of discriminating experiences, having increased internalized stigma, and having a low sense of social support are factors associated with suspected postnatal depression. Determining these associated factors is important when designing strategies to combat the development or persistence of depression in this population. Of course, risk factors for psychiatric conditions should take into account the context of the cultural structures in which they exist and could vary depending on the specific population studied.

While this study has focused on the prevalence, incidence, and risks for development of perinatal depression in HIV-infected women, it should be noted that few studies conducted in Africa have examined the efficacy of specific interventions for the treatment of depression in HIV-infected individuals. A recent systematic review[30] identified only 1 properly randomized controlled trial conducted in HIV-infected Ugandan children,[72] 1 nonrandomized controlled trial in HIV-infected Nigerian adults,[73] 1 nonrandomized controlled trial in HIV-infected South African women,[38] and 1 small case series in HIV-infected South African women[74] that examined mental health interventions in these populations. One additional study compared treatment of HIV-infected and HIV-negative women in Zimbabwe for postnatal depression with either pharmacotherapy or group problem-solving therapy.[75] All of these studies suggest that psychological and pharmacologic interventions can improve cognitive outcomes,[72] reduce depression scores,[38,73,75] increase safer sex practices,[73] increase disclosure to significant others,[73] and increase feelings of social support.[38] These limited studies, along with evidence from high-income countries, point to the potential for psychological and pharmacologic interventions to improve depression symptoms in HIV-infected individuals in Africa. However, only 2 of the above studies were conducted in the perinatal period, highlighting the need for further interventional studies to identify effective treatments for perinatal depression in this population. There have been other studies in Africa examining interventions for perinatal mental health, but these have not focused on HIV-infected women.[76,77] These interventions may present viable options, but would need to be further studied specifically in HIV-infected populations to demonstrate efficacy.

In summary, this study provides systematic review of the available evidence regarding the prevalence of perinatal depression in HIV-infected African women. These prevalence rates, even if only considering the conservative rates from studies using a diagnostic tool, are substantial and highlight an underserved need in this population. These results also highlight the limited knowledge regarding not only the prevalence and incidence of formally diagnosed perinatal depression, but also the associated risk factors and the consequences of perinatal depression for morbidity and mortality in HIV-infected women and their families. The largest gaps in knowledge currently appear to be in identifying those in the population that are at risk of depression, as well as studies of incident antenatal depression and postnatal depression. Studies aimed at identifying these risk factors should be a top priority, as they may lead to strategies to reduce incidence of depression that can have far-reaching effects on quality of life and HIV disease progression for both mother and child. Given that depression continues to be a major contributor to the global burden of disease, further high-quality evidence regarding perinatal depression in HIV-infected women is needed to make pregnancy and the postnatal period safer for women and children in Africa.

Submitted: April 7, 2014; accepted November 5, 2014.

Potential conflicts of interest: The authors report no conflicts of interest.

Funding/support: Dr Gaynes is supported by NC TRACS Institute, which is supported by grants UL1RR025747, KL2RR025746, and TLRR025745 from the NIH National Center for Research Resources and the National Center for Advancing Translational Sciences, National Institutes of Health. Dr Cholera is supported by grant 5F30MH096664 from the National Institute of Mental Health.

Role of the sponsors: None of the financial sponsors were directly responsible for the design, conduct, or reporting of the study.

Acknowledgments: The authors thank Gerald Gartlehner, MD, MPH, Department for Evidence-based Medicine and Clinical Epidemiology, Danube University, Krems, Austria, for his assistance with statistical analysis questions. Dr Gartlehner reports no conflicts of interest relative to the subject of this article.

REFERENCES

1. Gaynes BN, Gavin N, Meltzer-Brody S, et al. Perinatal depression: prevalence, screening accuracy, and screening outcomes. *Evid Rep Technol Assess (Summ)*. 2005;(119):1–8.
2. Gavin NI, Gaynes BN, Lohr KN, et al. Perinatal depression: a systematic review of prevalence and incidence. *Obstet Gynecol*. 2005;106 (5, pt 1):1071–1083.
3. Beck CT. Predictors of postpartum depression: an update. *Nurs Res*. 2001;50(5):275–285.
4. O'Hara MW, Swain AM. Rates and risks of postpartum depression: a meta-analysis. *Int Rev Psychiatry*. 1996;8(1):37–54.
5. Hirschfeld RM. The epidemiology of depression and the evolution of treatment. *J Clin Psychiatry*. 2012;73(suppl 1):5–9.
6. Evans J, Heron J, Patel RR, et al. Depressive symptoms during pregnancy and low birth weight at term: longitudinal study. *Br J Psychiatry*. 2007;191(1):84–85.
7. Field T, Diego M, Hernandez-Reif M. Prenatal depression effects on the fetus and newborn: a review. *Infant Behav Dev*. 2006;29(3):445–455.
8. Wisner KL, Sit DK, Hanusa BH, et al. Major depression and antidepressant treatment: impact on pregnancy and neonatal outcomes. *Am J Psychiatry*. 2009;166(5):557–566.
9. Lancaster CA, Gold KJ, Flynn HA, et al. Risk factors for depressive symptoms during pregnancy: a systematic review. *Am J Obstet Gynecol*. 2010;202(1):5–14.
10. Anoop S, Saravanan B, Joseph A, et al. Maternal depression and low maternal intelligence as risk factors for malnutrition in children: a community based case-control study from South India. *Arch Dis Child*. 2004;89(4):325–329.
11. Luoma I, Tamminen T, Kaukonen P, et al. Longitudinal study of maternal depressive symptoms and child well-being. *J Am Acad Child Adolesc Psychiatry*. 2001;40(12):1367–1374.
12. Martins C, Gaffan EA. Effects of early maternal depression on patterns of infant-mother attachment: a meta-analytic investigation. *J Child Psychol Psychiatry*. 2000;41(6):737–746.
13. Nelson DR, Hammen C, Brennan PA, et al. The impact of maternal depression on adolescent adjustment: the role of expressed emotion. *J Consult Clin Psychol*. 2003;71(5):935–944.
14. Patel V, DeSouza N, Rodrigues M. Postnatal depression and infant growth and development in low income countries: a cohort study from Goa, India. *Arch Dis Child*. 2003;88(1):34–37.
15. Rahman A, Iqbal Z, Bunn J, et al. Impact of maternal depression on infant nutritional status and illness: a cohort study. *Arch Gen Psychiatry*. 2004;61(9):946–952.
16. Weinberg MK, Tronick EZ. The impact of maternal psychiatric illness on infant development. *J Clin Psychiatry*. 1998;59 (suppl 2):53–61.
17. Beck CT. The effects of postpartum depression on child development: a meta-analysis. *Arch Psychiatr Nurs*. 1998;12(1):12–20.
18. Bonacquisti A, Geller PA, Aaron E. Rates and predictors of prenatal depression in women living with and without HIV. *AIDS Care*. 2014;26(1):100–106.
19. Robertson E, Grace S, Wallington T, et al. Antenatal risk factors for postpartum depression: a synthesis of recent literature. *Gen Hosp Psychiatry*. 2004;26(4):289–295.
20. Sawyer A, Ayers S, Smith H. Pre- and postnatal psychological wellbeing in Africa: a systematic review. *J Affect Disord*. 2010;123(1–3):17–29.
21. Joint United Nations Program on HIV/AIDS (UNAIDS). 2006 report on the global AIDS epidemic. UNAIDS Web site. http://www.UNAIDS.org. Accessed July 28, 2015.
22. Bing EG, Burnam MA, Longshore D, et al. Psychiatric disorders and drug use among human immunodeficiency virus-infected adults in the United States. *Arch Gen Psychiatry*. 2001;58(8):721–728.
23. Ciesla JA, Roberts JE. Meta-analysis of the relationship between HIV infection and risk for depressive disorders. *Am J Psychiatry*. 2001;158(5):725–730.
24. Atkinson JH, Heaton RK, Patterson TL, et al; HNRC Group. Two-year prospective study of major depressive disorder in HIV-infected men. *J Affect Disord*. 2008;108(3):225–234.
25. Lyketsos CG, Hutton H, Fishman M, et al. Psychiatric morbidity on entry to an HIV primary care clinic. *AIDS*. 1996;10(9):1033–1039.
26. Ickovics JR, Hamburger ME, Vlahov D, et al; HIV Epidemiology Research Study Group. Mortality, CD4 cell count decline, and depressive symptoms among HIV-seropositive women: longitudinal analysis from the HIV Epidemiology Research Study. *JAMA*. 2001;285(11):1466–1474.
27. Kacanek D, Jacobson DL, Spiegelman D, et al. Incident depression symptoms are associated with poorer HAART adherence: a longitudinal analysis from the Nutrition for Healthy Living study. *J Acquir Immune Defic Syndr*. 2010;53(2):266–272.
28. Pence BW, Miller WC, Gaynes BN, et al. Psychiatric illness and virologic response in patients initiating highly active antiretroviral therapy. *J Acquir Immune Defic Syndr*. 2007;44(2):159–166.
29. Rubin LH, Cook JA, Grey DD, et al. Perinatal depressive symptoms in HIV-infected versus HIV-uninfected women: a prospective study from preconception to postpartum. *J Womens Health (Larchmt)*. 2011;20(9):1287–1295.
30. Mayston R, Kinyanda E, Chishinga N, et al. Mental disorder and the outcome of HIV/AIDS in low-income and middle-income countries: a systematic review. *AIDS*. 2012;26(suppl 2):S117–S135.
31. Kapetanovic S, Dass-Brailsford P, Nora D, et al. Mental health of HIV-seropositive women during pregnancy and postpartum period: a comprehensive literature review. *AIDS Behav*. 2014;18(6):1152–1173.
32. Collins CH, Zimmerman C, Howard LM. Refugee, asylum seeker, immigrant women and postnatal depression: rates and risk factors. *Arch Women Ment Health*. 2011;14(1):3–11.
33. Mirza I, Jenkins R. Risk factors, prevalence, and treatment of anxiety and depressive disorders in Pakistan: systematic review. *BMJ*. 2004;328(7443):794.
34. Fisher J, Cabral de Mello M, Patel V, et al. Prevalence and determinants of common perinatal mental disorders in women in low- and lower-middle-income countries: a systematic review. *Bull World Health Organ*. 2012;90(2):139G–149G.
35. Cuca YP, Onono M, Bukusi E, et al. Factors associated with pregnant women's anticipations and experiences of HIV-related stigma in rural Kenya. *AIDS Care*. 2012;24(9):1173–1180.
36. Mundell JP, Visser MJ, Makin JD, et al. The impact of structured support groups for pregnant South African women recently

diagnosed HIV positive. *Women Health*. 2011;51(6):546–565.
37. Antelman G, Kaaya S, Wei R, et al. Depressive symptoms increase risk of HIV disease progression and mortality among women in Tanzania. *J Acquir Immune Defic Syndr*. 2007;44(4):470–477.
38. Futterman D, Shea J, Besser M, et al. Mamekhaya: a pilot study combining a cognitive-behavioral intervention and mentor mothers with PMTCT services in South Africa. *AIDS Care*. 2010;22(9):1093–1100.
39. Kaaya SF, Blander J, Antelman G, et al. Randomized controlled trial evaluating the effect of an interactive group counseling intervention for HIV-positive women on prenatal depression and disclosure of HIV status. *AIDS Care*. 2013;25(7):854–862.
40. Kaaya SF, Fawzi MC, Mbwambo JK, et al. Validity of the Hopkins Symptom Checklist-25 amongst HIV-positive pregnant women in Tanzania. *Acta Psychiatr Scand*. 2002;106(1):9–19.
41. Manikkam L, Burns JK. Antenatal depression and its risk factors: an urban prevalence study in KwaZulu-Natal. *S Afr Med J*. 2012;102(12):940–944.
42. Rochat TJ, Tomlinson M, Newell ML, et al. Detection of antenatal depression in rural HIV-affected populations with short and ultrashort versions of the Edinburgh Postnatal Depression Scale (EPDS). *Arch Women Ment Health*. 2013;16(5):401–410.
43. Smith Fawzi MC, Kaaya SF, Mbwambo J, et al. Multivitamin supplementation in HIV-positive pregnant women: impact on depression and quality of life in a resource-poor setting. *HIV Med*. 2007;8(4):203–212.
44. Stranix-Chibanda L, Chibanda D, Chingono A, et al. Screening for psychological morbidity in HIV-infected and HIV-uninfected pregnant women using community counselors in Zimbabwe. *J Int Assoc Physicians AIDS Care (Chic)*. 2005;4(4):83–88.
45. Tomlinson M, O'Connor MJ, le Roux IM, et al. Multiple risk factors during pregnancy in South Africa: the need for a horizontal approach to perinatal care. *Prev Scir*. 2014;15(3):277–282.
46. Chersich MF, Luchters SM, Yard E, et al. Morbidity in the first year postpartum among HIV-infected women in Kenya. *Int J Gynaecol Obstet*. 2008;100(1):45–51.
47. Chibanda D, Mangezi W, Tshimanga M, et al. Postnatal depression by HIV status among women in Zimbabwe. *J Womens Health (Larchmt)*. 2010;19(11):2071–2077.
48. Cyimana A, Andrews B, Ahmed Y, et al. HIV/AIDS and Postnatal Depression at the University Teaching Hospital, Lusaka, Zambia. *Med J Zambia*. 2010;37(2):78–83.
49. Hartley C, Pretorius K, Mohamed A, et al. Maternal postpartum depression and infant social withdrawal among human immunodeficiency virus (HIV) positive mother-infant dyads. *Psychol Health Med*. 2010;15(3):278–287.
50. Okronipa HE, Marquis GS, Lartey A, et al. Postnatal depression symptoms are associated with increased diarrhea among infants of HIV-positive Ghanaian mothers. *AIDS Behav*. 2012;16(8):2216–2225.
51. Peltzer K, Shikwane ME. Prevalence of postnatal depression and associated factors among HIV-positive women in primary care in Nkangala District, South Africa. *South Afr J HIV Med*. 2011;12(4):24–28.
52. Stewart RC, Umar E, Kauye F, et al. Maternal common mental disorder and infant growth—a cross-sectional study from Malawi. *Matern Child Nutr*. 2008;4(3):209–219.
53. Uriyo JG, Abubakar A, Swai M, et al. Prevalence and correlates of common mental disorders among mothers of young children in Kilimanjaro Region of Tanzania. *PLoS ONE*. 2013;8(7):e69088.
54. Dow A, Dube Q, Pence BW, et al. Postpartum depression and HIV infection among women in Malawi. *J Acquir Immune Defic Syndr*. 2014;65(3):359–365.
55. Nöthling J, Martin CL, Laughton B, et al. Maternal post-traumatic stress disorder, depression and alcohol dependence and child behaviour outcomes in mother-child dyads infected with HIV: a longitudinal study. *BMJ Open*. 2013;3(12):e003638.
56. Collin SM, Chisenga MM, Kasonka L, et al. Factors associated with postpartum physical and mental morbidity among women with known HIV status in Lusaka, Zambia. *AIDS Care*. 2006;18(7):812–820.
57. Bech P, Rasmussen NA, Olsen LR, et al. The sensitivity and specificity of the Major Depression Inventory, using the Present State Examination as the index of diagnostic validity. *J Affect Disord*. 2001;66(2–3):159–164.
58. Adewuya AO, Ola BA, Dada AO, et al. Validation of the Edinburgh Postnatal Depression Scale as a screening tool for depression in late pregnancy among Nigerian women. *J Psychosom Obstet Gynaecol*. 2006;27(4):267–272.
59. Chibanda D, Mangezi W, Tshimanga M, et al. Validation of the Edinburgh Postnatal Depression Scale among women in a high HIV prevalence area in urban Zimbabwe. *Arch Women Ment Health*. 2010;13(3):201–206.
60. Chipimo PJ, Fylkesnes K. Comparative validity of screening instruments for mental distress in Zambia. *Clin Pract Epidemol Ment Health*. 2010;6(1):4–15.
61. Lawrie TA, Hofmeyr GJ, de Jager M, et al. Validation of the Edinburgh Postnatal Depression Scale on a cohort of South African women. *S Afr Med J*. 1998;88(10):1340–1344.
62. Myer L, Smit J, Roux LL, et al. Common mental disorders among HIV-infected individuals in South Africa: prevalence, predictors, and validation of brief psychiatric rating scales. *AIDS Patient Care STDS*. 2008;22(2):147–158.
63. Patel V, Simunyu E, Gwanzura F, et al. The Shona Symptom Questionnaire: the development of an indigenous measure of common mental disorders in Harare. *Acta Psychiatr Scand*. 1997;95(6):469–475.
64. Galvao TF, Silva MT, Zimmermann IR, et al. Pubertal timing in girls and depression: a systematic review. *J Affect Disord*. 2014;155:13–19.
65. Stewart RC, Kauye F, Umar E, et al. Validation of a Chichewa version of the self-reporting questionnaire (SRQ) as a brief screening measure for maternal depressive disorder in Malawi, Africa. *J Affect Disord*. 2009;112(1–3):126–134.
66. Peltzer K, Sikwane E, Majaja M. Factors associated with short-course antiretroviral prophylaxis (dual therapy) adherence for PMTCT in Nkangala district, South Africa. *Acta Paediatr*. 2011;100(9):1253–1257.
67. Hendrick V, Altshuler L, Cohen L, et al. Evaluation of mental health and depression during pregnancy: position paper. *Psychopharmacol Bull*. 1998;34(3):297–299.
68. Kapetanovic S, Christensen S, Karim R, et al. Correlates of perinatal depression in HIV-infected women. *AIDS Patient Care STDS*. 2009;23(2):101–108.
69. Tomlinson M, Swartz L, Kruger LM, et al. Manifestations of affective disturbance in sub-Saharan Africa: key themes. *J Affect Disord*. 2007;102(1–3):191–198.
70. Tsai AC, Scott JA, Hung KJ, et al. Reliability and validity of instruments for assessing perinatal depression in African settings: systematic review and meta-analysis. *PLoS ONE*. 2013;8(12):e82521.
71. Bass JK, Ryder RW, Lammers MC, et al. Post-partum depression in Kinshasa, Democratic Republic of Congo: validation of a concept using a mixed-methods cross-cultural approach. *Trop Med Int Health*. 2008;13(12):1534–1542.
72. Boivin MJ, Busman RA, Parikh SM, et al. A pilot study of the neuropsychological benefits of computerized cognitive rehabilitation in Ugandan children with HIV. *Neuropsychology*. 2010;24(5):667–673.
73. Olley BO. Improving well-being through psycho-education among voluntary counseling and testing seekers in Nigeria: a controlled outcome study. *AIDS Care*. 2006;18(8):1025–1031.
74. Nachega JB, Uthman OA, Anderson J, et al. Adherence to antiretroviral therapy during and after pregnancy in low-income, middle-income, and high-income countries: a systematic review and meta-analysis. *AIDS*. 2012;26(16):2039–2052.
75. Chibanda D, Shetty AK, Tshimanga M, et al. Group problem-solving therapy for postnatal depression among HIV-positive and HIV-negative mothers in Zimbabwe. *J Int Assoc Provid AIDS Care*. 2014;13(4):335–341.
76. le Roux IM, Tomlinson M, Harwood JM, et al. Outcomes of home visits for pregnant mothers and their infants: a cluster randomized controlled trial. *AIDS*. 2013;27(9):1461–1471.
77. Tsai AC, Tomlinson M, Dewing S, et al. Antenatal depression case finding by community health workers in South Africa: feasibility of a mobile phone application. *Arch Women Ment Health*. 2014;17(5):423–431.

Editor's Note: We encourage authors to submit papers for consideration as a part of our Early Career Psychiatrists section. Please contact Erika F. H. Saunders, MD, at esaunders@psychiatrist.com.