Depression and associated factors among human immunodeficiency virus-positive pregnant women in sub-Saharan Africa: systematic review and meta-analysis

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BACKGROUND: Despite its severe impact on both maternal and fetal health, antenatal depression has not received as much attention in the healthcare community as postnatal depression. Comprehensive evidence is very important to suggest informed decisions and strategies to the Ministry of Health. Therefore, this study aims to estimate the pooled prevalence of depression and to identify associated factors among pregnant women living with human immunodeficiency virus (HIV)/AIDS in sub-Saharan Africa.

METHOD: Between May 15, 2024, and June 21, 2024, a systematic and thorough literature search was conducted using reputable electronic databases (PubMed, Cochrane Library) and web sources (Science Direct, African Journals Online, Google Scholar). The quality of the included studies was assessed using the Joanna Briggs Institute critical appraisal checklist for analytical cross-sectional studies, which includes 9 criteria. Heterogeneity among the studies was examined using Cochrane's Q and I^2 statistics. A random-effects model was employed to compute the pooled estimate of depression among pregnant women living with HIV/AIDS.

RESULT: The initial database search yielded 39,000 articles. The pooled prevalence of depression among pregnant women living with HIV/AIDS in sub-Saharan Africa was estimated to be 39.86% (95% confidence interval [CI]: 34.89—44.83, P=.000). Factors associated with depression included experiencing intimate partner violence (pooled odd ratio [POR]=1.98; 95% CI: 1.56, 32.51), poor adherence to antiretroviral therapy (POR=2.16; 95% CI: 1.70, 2.74), and household food insecurity (POR=2.40; 95% CI: 1.69, 3.42).

CONCLUSION: Over one-third of pregnant women with HIV/AIDS experience depression, linked to factors like intimate partner violence, food insecurity, and poor adherence to antiretroviral therapy. Prioritize tailored mental health services and peer support groups. Increase education on intimate partner violence and implement nutritional support programs. Promote community initiatives and simplify ART regimens for improved health outcomes.

Key words: associated factors, depression, living with HIV/AIDS, pregnant women, sub-Saharan Africa

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Background

Depression is marked by feelings of low self-worth, a lack of interest in activities, regret, restlessness, appetite loss, fatigue, and difficulty concentrating.[1] The World Health Organization identifies depression as a leading cause of disability for both men and women, with the burden being 50% higher in women than in men.[2] At its most severe, depression can result in suicide, claiming approximately 1 million lives worldwide each year.[1] Additionally, depression is the most prevalent psychiatric issue among individuals living with the human immunodeficiency virus (HIV).[3] By 2030, depression and HIV/AIDS are projected to be the top two causes of disease burden globally.[4]

To address mental health, international action plans have been developed with a key objective of implementing strategies to prevent mental illness.[5] Ethiopia, for instance, has established national mental health strategies aimed at increasing mental health care access for particularly vulnerable groups, including pregnant women, postpartum women, and individuals living with HIV/AIDS.[6] Antenatal depression refers to depression experienced during pregnancy,[7] with global prevalence rates ranging from 15% to 65%, higher in low and middle income countries (LMICs).[8,9] HIV-infected pregnant women are among the most vulnerable, experiencing high rates of depression and psychiatric disorders.[10] Antenatal depression in HIV-positive pregnant women can accelerate HIV disease progression and raise maternal morbidity and mortality rate.[11] Additionally, HIV-positive women with depression tend to have poor adherence to antiretroviral

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Why was this study conducted?
To estimate the pooled prevalence of antenatal depression and identify associated factors among HIV-positive pregnant women in Sub-Saharan Africa, where overlapping burdens of HIV and mental health conditions pose significant public health challenges.

Key findings
The pooled prevalence of depression among HIV-positive pregnant women in Sub-Saharan Africa was substantial, indicating a major public health concern. Key factors significantly associated with depression included low social support, intimate partner violence, advanced HIV disease stage, unplanned pregnancy, and low socioeconomic status.

What does this add to what is known?
This study highlights the high burden of antenatal depression in HIV-positive pregnant women in Sub-Saharan Africa and identifies common psychosocial and clinical risk factors. The findings underscore the critical need for routine mental health screening and integrated psychosocial support within antenatal and HIV care services in the region.

therapy (ART).[12] Severe forms of depression, including suicidal ideation or self-harm, are also relatively common during pregnancy.[13]

Antenatal depression significantly raises the risk of birth complications, including prolonged labor, and can have lasting, even permanent effects on child development and well-being.[14] Some complications for the baby include low birth weight, preterm birth, small for gestational age, delayed cognitive and language development, behavioral issues, poor academic performance, and emotional problems. Additionally, antenatal depression negatively impacts maternal health-seeking behavior and may lead to increased risky behaviors such as substance use. Among HIV-infected women, antenatal depression might accelerate HIV progression and increase maternal morbidity and mortality. Moreover, untreated depression during pregnancy is a risk factor for postpartum depression and may reduce the likelihood of exclusive breastfeeding after delivery.[15−21] Despite its severe impact on both maternal and fetal health, antenatal depression has not received as much attention in the healthcare community as postnatal depression.[22]

Several studies conducted in various countries have identified several factors associated with antenatal depression. These factors include single marital status, unemployment, unplanned pregnancies, ART nonadherence, duration of ART use, intimate partner violence, poor social support, and a history of depression.[23−28]

Reducing premature mortality from noncommunicable diseases through prevention, treatment, and the promotion of mental health and well-being is a global priority, as outlined in the third component of the Sustainable Development Goals.[29] One approach to achieving this goal is the routine screening for and timely intervention in antenatal depression.

This study reviewed literature on antenatal depression among pregnant women living with HIV/AIDS in sub-Saharan Africa. However, the existing studies reveal variations in the prevalence of depression and its associated factors, and to the investigator's knowledge, these studies have not been systematically examined. Therefore, this systematic review and meta-analysis aimed to estimate the overall prevalence of depression and identify associated factors among pregnant women living with HIV/AIDS in sub-Saharan Africa. The findings of this meta-analysis will assist policymakers and other stakeholders in effectively implementing strategies for the prevention and control of antenatal depression.

Materials and methods
This systematic review and meta-analysis were meticulously carried out in accordance with PRISMA guidelines, ensuring transparent and detailed reporting as outlined in S1 File.[28] Adhering to these guidelines provides a robust and unbiased synthesis of the evidence, strengthening the study's reliability and validity. Furthermore, the review has been registered with the Prospective Register of Systematic Reviews (PROSPERO) under the identifier CRD42024563944.

Study setting
This systematic review and meta-analysis examine depression and its associated factors among HIV-positive pregnant women in sub-Saharan Africa.

Searching strategy of articles
Published articles were searched using the following databases: reputable databases (PubMed, Cochrane Library), Web searches (Science Direct, African Journals Online, and Google Scholar), spanning from April 15, 2024, to June 21, 2024. The search terms were organized following the Medical Subject Headings thesaurus (MESH) using the following terms: "depression," OR "sadness," OR "unhappiness," AND "determinant factors," OR "associated factors." The search was performed by two authors (YAF, GKN, and WCT).

Eligibility criteria
Our review included cross-sectional and prospective studies that reported on the prevalence of depression and associated factors among pregnant women living with HIV/AIDS in sub-Saharan African countries. We selected medium and high-quality articles published in peer-reviewed English-language journals. The review encompassed all articles published up to June 21, 2024. However, studies that did not report the prevalence of depression, as well as case reports, abstracts, and unpublished studies, were excluded from our analysis.

Outcome of interest

The main outcome of interest for this review was the prevalence of antenatal depression which defined as a syndrome of depression, in which women experience during a period of pregnancy.[30] The total score of >10 points on the PHQ-9 scale was categorized to have a depressive syndrome.[31] For the analysis of the secondary outcomes (factors), we extracted data on factors that were associated with depression in primary studies. In examining factors associated with depression, data was used from adjusted odd ratio of primary studies to find the association between the independent variables and depression.

Article selection and data extraction

All articles retrieved from electronic databases were exported to EndNote X7. After removing duplicates, two authors (AMZ, GWA, and WCT) independently screened the articles, excluding those that were ineligible. The full texts of the selected articles were then obtained and thoroughly reviewed to ensure their suitability for data extraction. Articles that met the eligibility criteria were used as data sources for analysis. Data extraction was conducted by two authors (YAF and GKN using a standardized Microsoft Excel format. The data extraction form included the following study characteristics: corresponding author name, publication year, study setting, study design, sample size, participant/response rate, sampling technique, prevalence of depression, and associated factors. Any disagreements were resolved through discussion with a third author (AMZ).

Risk of bias (quality) assessment

Quality appraisal was conducted using the Joanna Briggs Institute (JBI) critical appraisal checklist for analytical cross-sectional studies, which includes nine criteria.[32] The checklist evaluates the following: (1) whether the sample frame was appropriate for the target population, (2) if the study participants were sampled appropriately, (3) the adequacy of the sample size, (4) whether the study subjects and setting were described in detail, (5) if the data analysis covered the identified sample sufficiently, (6) the validity of the methods used for identifying the condition, (7) whether the condition was measured consistently and reliably for all participants, (8) the appropriateness of the statistical analysis, and (9) the adequacy of the response rate. Each criterion was scored with 0 for "not reported or not appropriate" and 1 for "yes." The scores were then summed to provide a total quality score ranging from 0 to 9. Based on the total score, studies were classified into three quality categories: low (0−4), medium (5−7), and high (7−9).

Data synthesis and analysis

Data were extracted using a Microsoft Excel spreadsheet and subsequently imported into STATA version 11 for further analysis. The primary studies were described and summarized with tables, figures, and forest plots. A random-effects model was used to calculate the pooled estimate of depression, presented with a 95% confidence interval (CI). The association between various factors and depression among pregnant women living with HIV/AIDS was determined using odds ratios with 95% CIs. Due to the heterogeneity among the included studies, a random-effects model was applied during the meta-analysis. Heterogeneity was assessed using Cochran's Q statistic and I^2 statistics. Additionally, publication bias was evaluated through visual inspection of funnel plot asymmetry and Egger's regression tests, with a P value of less than .05 indicating significant publication biases.

Results

Study selection

The database search yielded 39,000 articles: 31,300 from Google Scholar, 540 from PubMed, 6951 from Science Direct, 200 from African Journals Online, and 9 from the Cochrane Library. After reviewing the titles and abstracts, we excluded 12,521 articles due to duplication. During the screening of the remaining 26,479 articles, 26,425 were excluded because their outcomes were not relevant to our study or their study populations differed from ours. The full texts of the remaining 54 articles were assessed for eligibility and quality, which resulted in the further exclusion of 44 articles, mainly because of variation in the study population and unreported outcomes of interest. Thus, 10 studies were included in the final analysis (Figure 1).

Characteristics of the included studies

This systematic review and meta-analysis incorporated 10 published articles, with participant numbers ranging from 99 to 663. Nine of these studies utilized a cross-sectional design to estimate the prevalence of depression. The articles were published over a span of nearly a decade, from 2013 to 2022. Geographically, the research was conducted across several sub-Saharan African countries: four studies took place in Ethiopia (32 −35, two in South Africa,[23,33] and one each in Tanzania, Uganda, Zimbabwe, and Nigeria.[24,26,27,34] Each study was published in a peer-reviewed journal, ensuring the quality and credibility of the research. This diverse geographic representation provides a comprehensive overview of depression among pregnant women living with HIV/AIDS in the region (Table).

Meta-analysis

Quality of the included studies

Based on the quality ratings, eight of the articles (80%) were classified as high quality, with scores ranging from 8 to 9, while two studies received a medium quality score of 6. The quality of each included study was evaluated using the nine criteria from the JBI critical appraisal checklist S2 File.

Publication bias: To evaluate publication bias, both funnel plots for visual inspection of asymmetry and Egger's regression tests were utilized. Egger's test revealed a statistically significant result (P=.000), indicating the presence of publication bias among the studies included in the analysis. Additionally, visual inspection of the funnel plots illustrated an uneven distribution of studies, further supporting the indication of bias in

FIGURE 1

Flow chart of study selection for systematic review and meta-analysis of depression and associated factors among pregnant women living with HIV/AIDS in sub-Saharan Africa, 2024
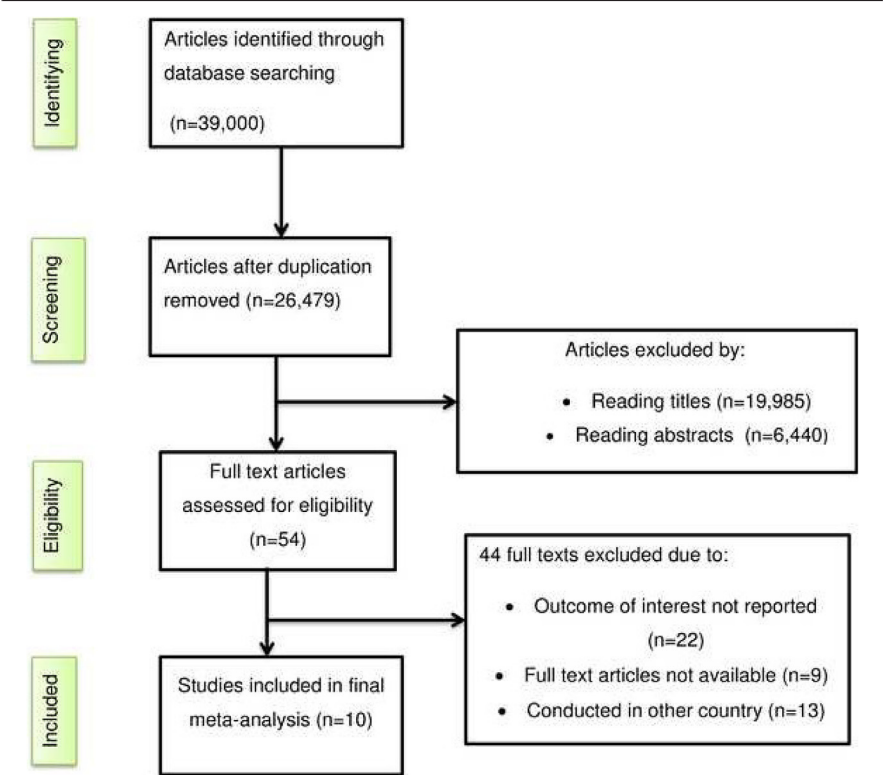
Ferede. Depression and associated factors among human immunodeficiency virus-positive pregnant women in sub-Saharan Africa. AJOG Glob Rep 2025.

publication across the reviewed literature (Figure 2).

Sensitivity analysis: Due to the presence of publication bias indicated by Egger's test (*P*=.000), a sensitivity analysis was performed, which showed that no single study had a disproportionate influence on the overall results (Figure 3).

Depression among HIV-positive pregnant women in sub-Saharan Africa

The pooled prevalence of depression among pregnant women living with HIV/AIDS in sub-Saharan Africa was determined to be 39.86% (95% CI: 34.89−44.83, *P*=.000). The analysis revealed significant heterogeneity across the included studies (I^2=100%, *P*=.000). Therefore, a random-effects model was employed to calculate the pooled prevalence of depression (Figure 4).

Sub-group analysis

Due to significant heterogeneity in the review, subgroup analysis was conducted using sample size as a grouping variable. The findings indicated that articles with a sample size greater than 326 participants reported a higher prevalence of depression at 41.865% (CI: 36.55, 47.17), while those with a sample size less than 326 participants reported a lower prevalence at 37.86% (CI: 29.07, 46.65) (Figure 5).

TABLE

Descriptive summary of primary studies included in the meta-analysis of the depression and associated factors among pregnant women living with HIV/AIDS in sub-Saharan Africa, 2024

Id	Author	Pub year	Region	Study design	Study population	Sample size	Prevalence (%)	Response rate (%)
1	Haile Michael Kindie	2021	Ethiopia	IBCS	Pregnant women living with HIV/AIDS	303	291	96
2	James Samwel	2019	Tanzania	IBCS	Pregnant women living with HIV/AIDS	208	200	96.2
3	Idowu Pius	2022	Nigeria	IBCS	pregnant women living with HIV/AIDS	127	99	77.9
4	Eugenia Nyamukoho	2019	Zimbabwe	IBCS	pregnant women living with HIV/AIDS	234	198	84.6
5	Angela Kaida	2014	Uganda	Prospective	pregnant women living with HIV/AIDS	447	407	91
6	Workeabeba Abebe	2022	Ethiopia	IBCS	pregnant women living with HIV/AIDS	397	368	92.7
7	Selam Yibeltal	2022	Ethiopia	IBCS	pregnant women living with HIV/AIDS	606	590	97.4
8	Nebiyu Solomon	2022	Ethiopia	IBCS	pregnant women living with HIV/AIDS	423	423	100
9	Karl Peltzera	2016	South Africa	IBCS	pregnant women living with HIV/AIDS	709	663	93.5
10	Tamsen J. Rochat	2013	South Africa	IBCS	pregnant women living with HIV/AIDS	156	109	69.8

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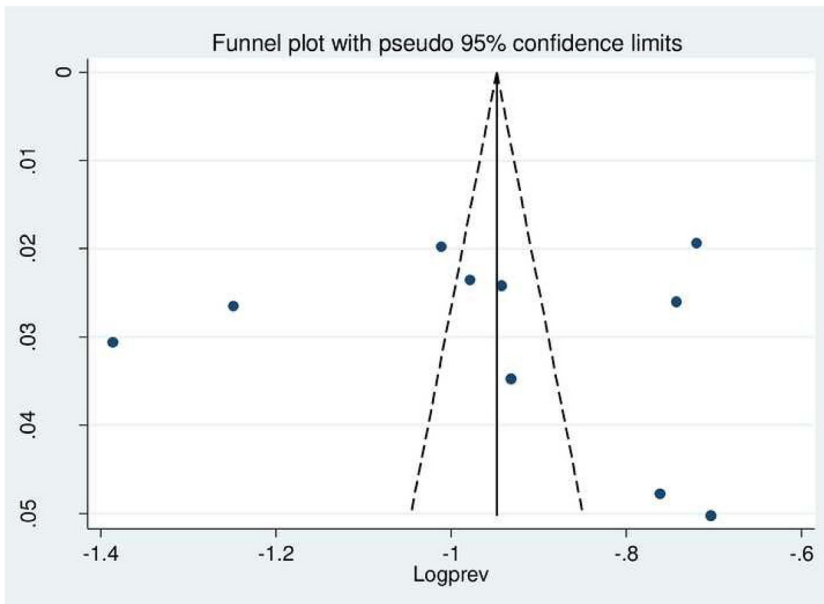
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Associated factors

In this study, some factors associated with depression were statistically analyzed, while others were not included due to inconsistencies in how independent variables related to the outcome were classified or grouped.

Three studies identified a significant link between intimate partner violence and depression among pregnant women. Those who experienced intimate partner violence had 1.98 times higher odds of developing depression compared to those who did not (pooled odd ratio [POR]=1.98; 95% CI: 1.56, 32.51). Given the homogeneity among the included studies (I^2=0.0%, P=.553), a fixed-effects model was used for the analysis. Two studies revealed a significant association between poor adherence to ART and depression among pregnant women. Those with poor ART adherence had 2.16 times higher odds of developing depression compared to those with good adherence (POR=2.16; 95% CI: 1.70, 2.74). Given the homogeneity among the included studies (I^2=0.0%, P=.553), a fixed-effects model was used for the analysis. Furthermore, two studies indicated a significant association between household food insecurity and depression among pregnant women. Those experiencing household food insecurity had 2.40 times higher odds of developing depression compared to those with secure household food (POR=2.40; 95% CI: 1.69, 3.42). Given the homogeneity among the included studies (I^2=0.0%, P=.553), a fixed-effects model was used for the analysis (Figure 6).
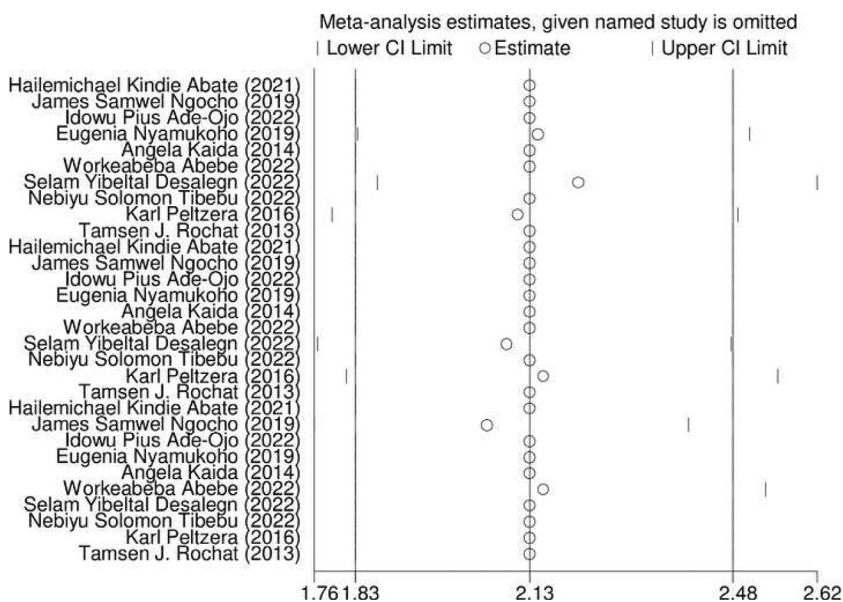
Discussion

This meta-analysis sought to assess the prevalence of depression among pregnant women living with HIV/AIDS in sub-Saharan Africa and to explore its associated factors. To our knowledge, this is the inaugural attempt at conducting a meta-analysis to establish both the general prevalence of depression and its determinants in this population across the region. Our findings indicate considerable variability in depression rates in sub-Saharan Africa, ranging from 25%[35] to 49.5%.[34] Pooling together the data reveals that the prevalence of depression among pregnant women who are living with HIV/AIDS in sub-Saharan Africa stands at 39.86% (95% CI: 34.89−44.83, P=.000). This aligns closely with studies conducted in Iran (42.1%).[36] One possible reason for the similar prevalence rates could be that both sub-Saharan Africa and Iran experience comparable socioeconomic
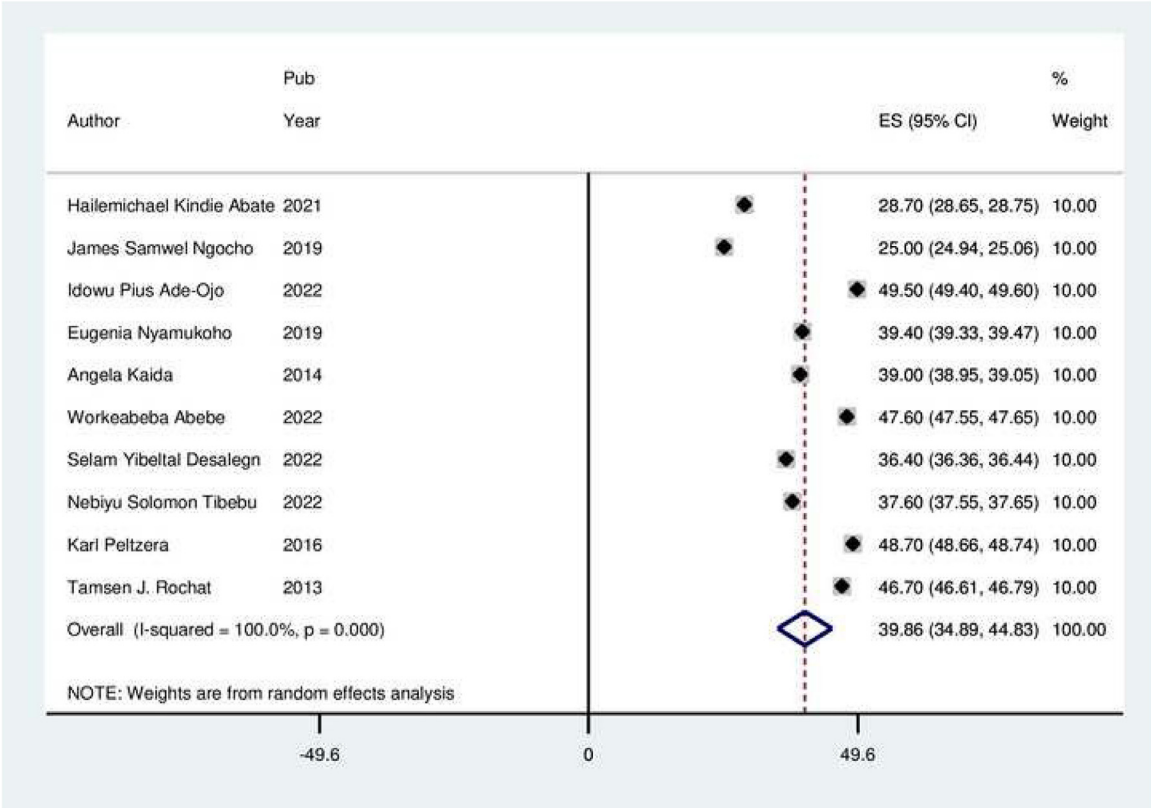
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challenges, such as poverty, restricted access to healthcare, and lower socio-economic status, which may lead to higher depression rates among vulnerable populations, including pregnant women living with HIV/AIDS. Furthermore, the use of similar methodologies, diagnostic criteria, and tools to measure depression in studies from these regions might also contribute to the observed consistency in prevalence rates.

The finding of this study is higher than the study conducted from United States (US) prevalence of 22%.[37] In sub-Saharan Africa, socio-economic challenges like poverty, limited healthcare access, and high unemployment rates intensify stress and psychological distress among pregnant women with HIV/AIDS, contributing significantly to higher rates of depression. The persistent stigma associated with HIV/AIDS in the region further complicates matters, leading to discrimination, social

isolation, and increased anxiety about personal health and the health of unborn children. These factors collectively create conditions conducive to depression, highlighting an urgent need for comprehensive support systems and integrated healthcare strategies to address mental health alongside medical care for this vulnerable demographic.

The prevalence reported in this study is lower than the 50.8% found in a previous study conducted in China.[38] This variation could be attributed to several factors. Cultural differences, including societal attitudes toward mental health, stigma, and social support systems, may influence both the experience and reporting of depression. Distinct coping mechanisms and community support structures in sub-Saharan Africa and China could also contribute to the observed discrepancy. Additionally, variations in the tools and methodologies used to assess depression—such as

differences in diagnostic criteria, screening instruments, and study designs—may affect prevalence estimates. Furthermore, disparities in healthcare systems play a role; China may have more established screening and detection mechanisms, leading to higher reported prevalence rates. In contrast, limited routine screening and potential underreporting in sub-Saharan Africa might result in lower estimates.

The study reveals that women who have endured intimate partner violence are nearly twice as likely to develop depression compared to those who have not experienced such violence. This result is consistent with findings from research conducted in lower- middle-income countries (LMICs).[39] It indicates that various forms of abuse—whether psychological, physical, or sexual—perpetrated by an intimate partner, particularly during pregnancy, can substantially increase the risk of

Subgroup analysis of depression among pregnant women living with HIV/AIDS in sub-Saharan Africa, 2024
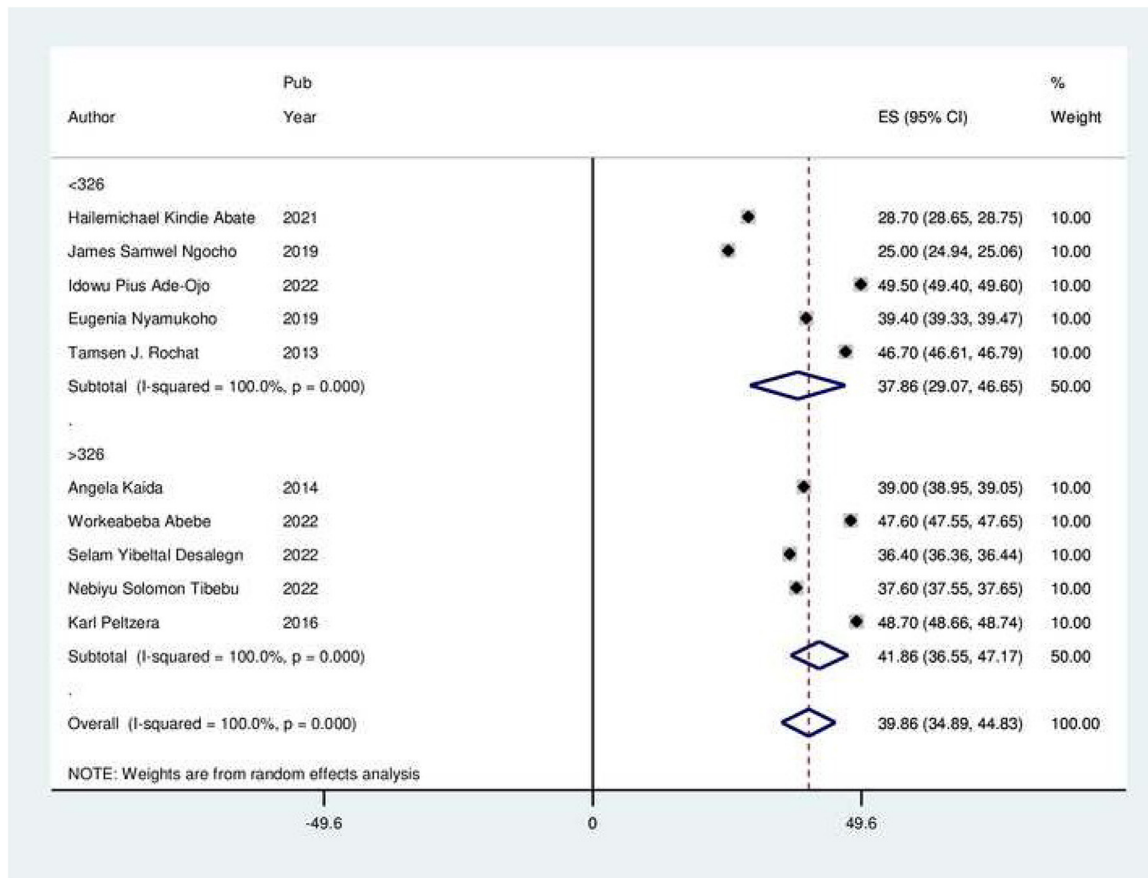
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developing depression. The impact of such violence is profound, as it not only affects the immediate well-being of women but also significantly contributes to the onset of depression, underscoring the critical need for targeted interventions to address intimate partner violence and its mental health repercussions.

Secondly, the findings of this study indicated that individuals experiencing depression were twice as likely to be noncompliant with their ART. Typically, the motivation to protect an unborn child from contracting HIV drives good adherence to preventive medication. However, symptoms of depression such as loss of interest, hopelessness, and fatigue may contribute to poor ART adherence, as noted in other research.[40,41] Addressing and managing depression symptoms are

crucial for improving ART adherence and ensuring the health of both the mother and her unborn child.[42]

Lastly, the study revealed that women experiencing food insecurity in their households had a higher likelihood of depression. This link between food insecurity and depression has also been noted in US.[43] Financial difficulties that hinder a woman's ability to meet her family's basic needs can adversely affect her mental health. Additionally, pregnancy may reduce a woman's employability and ability to work, particularly in jobs that impoverished women often undertake.[44] The study also found that pregnant women with one or more children were more likely to be depressed compared to those without children. This increased depression among women with children might be due to the additional economic

and time burdens that come with having a family.[45]

Limitations of the study

While this study is the first to systematically review and conduct a meta-analysis on depression among pregnant women with HIV/AIDS in sub-Saharan Africa, it does have some limitations. Primarily, it only included full-text articles published in English. Additionally, due to inconsistent definitions across the studies reviewed, the meta-analysis did not calculate a pooled odds ratio for all variables linked to depression in this population. The reliance solely on facility-based cross-sectional studies in all selected articles may also restrict the generalizability of the findings. Furthermore, the inclusion of studies from only six countries could impact the comprehensive assessment
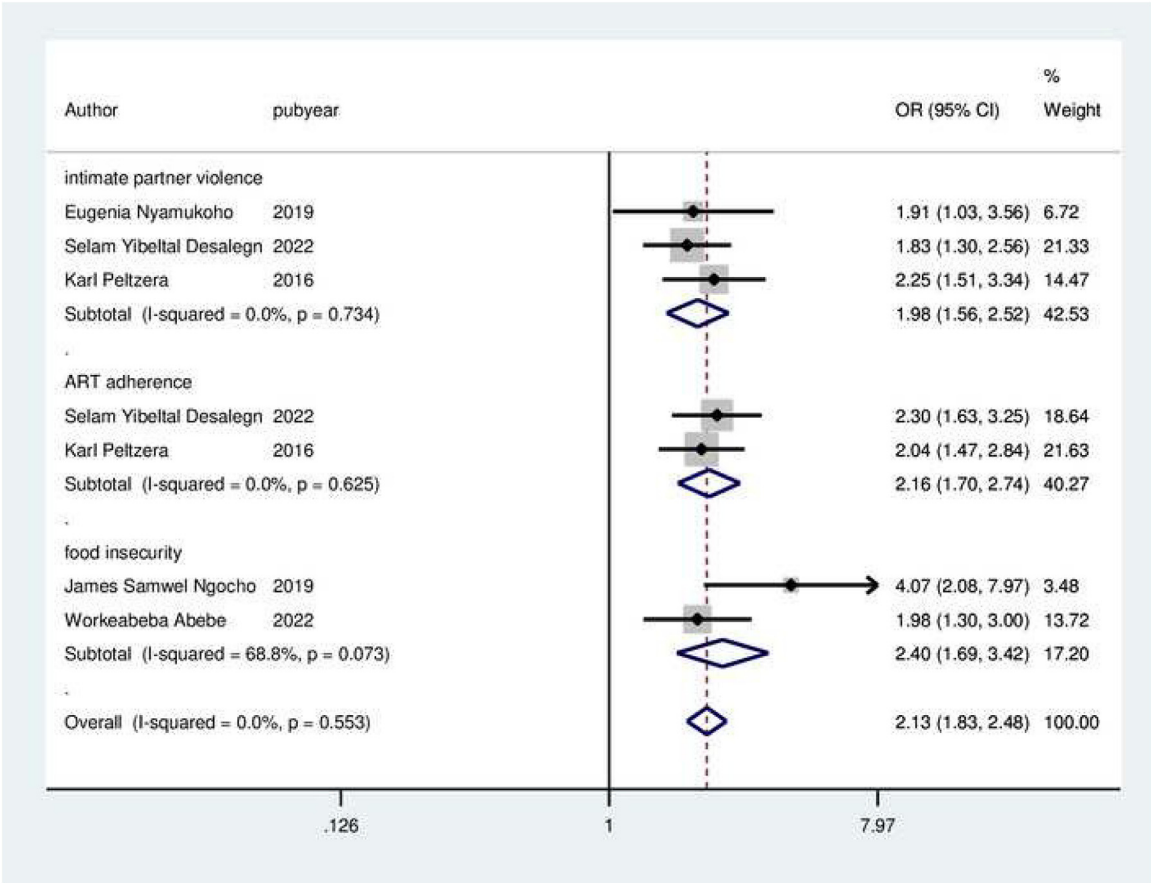
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of depression among pregnant women with HIV/AIDS in the region.

Conclusion

The findings reveal that over one-third of pregnant women with HIV/AIDS experience depression. There are notable links between this depression and factors such as intimate partner violence, household food insecurity, and inadequate adherence to ART. To address the mental health challenges of pregnant women with HIV/AIDS, it is essential to provide tailored mental health services, including counseling and therapy and establishes peer support groups for emotional support and shared coping strategies. Additionally, increasing education and awareness about the impacts of intimate partner violence, creating safe spaces and helplines for abuse reporting, and implementing nutritional support programs can significantly improve their well-being. Promoting community gardens and food banks can help reduce food insecurity while educating women about the importance of ART adherence and simplifying regimens to manage side effects will support their overall health. ∎

CRediT authorship contribution statement

Yeshiwas Ayale Ferede: Writing — review & editing, Writing — original draft, Formal analysis, Conceptualization. **Agerie Mengistie Zeleke:** Writing — review & editing, Writing — original draft, Supervision. **Getaw Wubie Assefa:** Data curation, Supervision, Validation, Visualization, Writing — original draft, Writing — review & editing. **Getanew Kegne Nigate:** Formal analysis, Supervision, Visualization, Writing — original draft, Writing — review & editing. **Worku Chekol Tassew:** Conceptualization, Data curation, Software, Supervision, Writing — original draft, Writing — review & editing.

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Supplementary materials

REFERENCES

1. Marcus M, Yasamy MT, van Ommeren M, Chisholm D, Saxena S. Depression: a global public health concern. 2012.

2. Woody C, Ferrari A, Siskind D, Whiteford H, Harris M. A systematic review and meta-regression of the prevalence and incidence of perinatal depression. J Affect Disord 2017;219:86–92.

3. Arseniou S, Arvaniti A, Samakouri M. HIV infection and depression. Psychiatry Clin Neurosci 2014;68(2):96–109.

4. Cd M. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med 2006;3:2011–30.

5. Saxena S, Funk M, Chisholm D. World health assembly adopts comprehensive mental health action plan 2013−2020. The Lancet 2013;381(9882):1970–1.

6. Health FDRoEMo. National Mental Health Strategy 2012/13−2015/16. Public policy document, Federal Democratic Republic of Ethiopia. 2012.

7. Austin M. Highest N and the Expert Working Group. Mental health care in the perinatal period: Australian clinical practice guideline centre of perinatal excellence depression during pregnancy. 2017.

8. Dadi AF, Miller ER, Bisetegn TA, Mwanri L. Global burden of antenatal depression and its association with adverse birth outcomes: an umbrella review. BMC Public Health 2020;20:1–16.

9. Halim N, Beard J, Mesic A, Patel A, Henderson D, Hibberd P. Intimate partner violence during pregnancy and perinatal mental disorders in low and lower middle income countries: a systematic review of literature, 1990−2017. Clin Psychol Rev 2018;66:117–35.

10. Kapetanovic S, Dass-Brailsford P, Nora D, Talisman N. Mental health of HIV-seropositive women during pregnancy and postpartum period: a comprehensive literature review. AIDS Behav 2014;18:1152–73.

11. Desalegn SY, Asaye MM, Temesgan WZ, Badi MB. Antenatal depression and associated factors among HIV-positive pregnant women in South Gondar zone public health facilities, northwest Ethiopia, a cross-sectional study. Clin Epidemiol Global Health 2022;16:101072.

12. Abebe W, Gebremariam M, Molla M, Teferra S, Wissow L, Ruff A. Prevalence of depression among HIV-positive pregnant women and its association with adherence to antiretroviral therapy in Addis Ababa, Ethiopia. PLoS One 2022;17(1):e0262638.

13. Arachchi NSM, Ganegama R, Husna AWF, et al. Suicidal ideation and intentional self-harm in pregnancy as a neglected agenda in maternal health; an experience from rural Sri Lanka. Reprod Health 2019;16:1–7.

14. Wagner GJ, McBain RK, Akena D, et al. Maternal depression treatment in HIV (M-DEPTH): study protocol for a cluster randomized controlled trial. Medicine 2019;98(27):e16329.

15. Fekadu Dadi A, Miller ER, Mwanri L. Antenatal depression and its association with adverse birth outcomes in low and middle-income countries: a systematic review and meta-analysis. PLoS One 2020;15(1):e0227323.

16. Eastwood J, Ogbo FA, Hendry A, Noble J, Page A, Group EYR. The impact of antenatal depression on perinatal outcomes in Australian women. PLoS One 2017;12(1):e0169907.

17. Antelman G, Kaaya S, Wei R, et al. Depressive symptoms increase risk of HIV disease progression and mortality among women in Tanzania. JAIDS: J Acquir Immune Defic Syndr 2007;44(4):470–7.

18. Gelaye B, Rondon MB, Araya R, Williams MA. Epidemiology of maternal depression, risk factors, and child outcomes in low-income and middle-income countries. Lancet Psychiatry 2016;3(10):973–82.

19. Smith MV, Shao L, Howell H, Lin H, Yonkers KA. Perinatal depression and birth outcomes in a Healthy Start project. Matern Child Health J 2011;15:401–9.

20. Tuthill EL, Pellowski JA, Young SL, Butler LM. Perinatal depression among HIV-infected women in KwaZulu-Natal South Africa: prenatal depression predicts lower rates of exclusive breastfeeding. AIDS Behav 2017;21:1691–8.

21. Shen H, Magnusson C, Rai D, et al. Associations of parental depression with child school performance at age 16 years in Sweden. JAMA Psychiatry 2016;73(3):239–46.

22. Shidhaye P, Giri P. Maternal depression: a hidden burden in developing countries. Ann Med Health Sci Res 2014;4(4):463–5.

23. Peltzer K, Rodriguez VJ, Jones D. Prevalence of prenatal depression and associated factors among HIV-positive women in primary care in Mpumalanga province, South Africa. SAHARA J 2016;13(1):60–7.

24. Ngocho JS, Watt MH, Minja L, et al. Depression and anxiety among pregnant women living with HIV in Kilimanjaro region, Tanzania. PLoS One 2019;14(10):e0224515.

25. Harrington BJ, Pence BW, John M, et al. Prevalence and factors associated with antenatal depressive symptoms among women enrolled in Option B+ antenatal HIV care in Malawi: a cross-sectional analysis. J Ment Health 2019;28(2):198–205.

26. Kaida A, Matthews LT, Ashaba S, et al. Depression during pregnancy and the postpartum among HIV-infected women on antiretroviral therapy in Uganda. JAIDS: J Acquir Immune Defic Syndr 2014;67:S179–S87.

27. Nyamukoho E, Mangezi W, Marimbe B, Verhey R, Chibanda D. Depression among HIV positive pregnant women in Zimbabwe: a primary health care based cross-sectional study. BMC Pregnancy Childbirth 2019;19:1–7.

28. Bonacquisti A, Geller PA, Aaron E. Rates and predictors of prenatal depression in women living with and without HIV. Aids Care 2014;26(1):100–6.

29. Thakur JS, Nangia R, Singh S. Progress and challenges in achieving noncommunicable diseases targets for the sustainable development goals. FASEB BioAdvances 2021;3(8):563.

30. Austin M. Perinatal period: Australian clinical practice guideline. 2017.

31. Kim MH, Mazenga AC, Devandra A, et al. Prevalence of depression and validation of the Beck Depression Inventory-II and the Children's Depression Inventory-Short amongst HIV-positive adolescents in Malawi. J Int AIDS Soc 2014;17(1):18965.

32. Omura M, Maguire J, Levett-Jones T, Stone TE. The effectiveness of assertiveness communication training programs for healthcare professionals and students: a systematic review. Int J Nurs Stud 2017;76:120–8.

33. Rochat TJ, Bland RM, Tomlinson M, Stein A. Suicide ideation, depression and HIV among pregnant women in rural South Africa. 2013;5 (3).

34. Ade-Ojo IP, Dada MU, Adeyanju TB. Comparison of Anxiety and Depression Among HIV-Positive and HIV-Negative Pregnant Women During COVID-19 Pandemic in Ekiti State, Southwest Nigeria. Int J Gen Med 2022;15:4123–30.

35. Ngocho JS, Watt MH, Minja L, Knettel BA. Depression and anxiety among pregnant women living with HIV in Kilimanjaro region. Tanzania 2019;14(10):e0224515.

36. Hamzehgardeshi Z, Omidvar S, Amoli AA, Firouzbakht M. Pregnancy-related anxiety and its associated factors during COVID-19 pandemic in Iranian pregnant women: a web-based cross-sectional study. BMC Pregnancy Childbirth 2021;21:1–9.

37. Kapetanovic S, Christensen S, Karim R, et al. Correlates of perinatal depression in HIV-infected women. AIDS Patient Care STDs 2009;23(2):101–8.

38. Zhu Q-Y, Huang D-S, Lv J-D, Guan P, Bai X-H. Prevalence of perinatal depression among HIV-positive women: a systematic review and meta-analysis. BMC Psychiatry 2019;19(1):330.

39. Halim N, Beard J, Mesic A, Patel A, Henderson D, Hibberd P. Intimate partner violence during pregnancy and perinatal mental disorders in low and lower middle income countries: a systematic review of literature, 1990-2017. Clin Psychol Rev 2018;66:117–35.

40. Shubber Z, Mills EJ, Nachega JB, Vreeman R. Patient-reported barriers to adherence to antiretroviral therapy: a systematic review and meta-analysis. PLoS Med 2016;13(11):e1002183.

41. Nakimuli-Mpungu E, Bass JK, Alexandre P, et al. Depression, alcohol use and adherence to antiretroviral therapy in sub-Saharan Africa: a systematic review. AIDS Behav 2012;16(8):2101–18.

42. Wagner GJ, Ghosh-Dastidar B, Robinson E, et al. Effects of depression alleviation on ART adherence and HIV clinic attendance in Uganda,

and the mediating roles of self-efficacy and motivation. AIDS Behav 2017;21(6):1655–64.

43. Blaney NT, Fernandez MI, Ethier KA, et al. Psychosocial and behavioral correlates of depression among HIV-infected pregnant women. AIDS Patient Care STDs 2004;18 (7):405–15.

44. Tolla T. Black women's experiences of domestic work: domestic workers in Mpumalanga. 2013.

45. Kapetanovic S, Dass-Brailsford P, Nora D, Talisman N. Mental health of HIV-seropositive women during pregnancy and postpartum period: a comprehensive literature review. AIDS Behav 2014;18(6):1152–73.