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ORIGINAL PAPER

Effects of a Home-Based Intervention on HIV Prevention Health Behaviors in Pregnant/Postpartum Kenyan Women: Estimating Moderating Effects of Depressive Symptoms

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Abstract

We estimated effects of maternal depressive symptoms, utilizing the Patient Health Questionnaire-8 (PHQ-8), on women's HIV prevention behaviors in Migori County, Kenya. Pregnant women ≥ 18 years old, with gestational age of < 37 weeks, were randomized into standard care or three home visits (2 during pregnancy, 1 postpartum) promoting couple HIV testing and counseling (CHTC) and HIV prevention. Of 105 female participants, 37 (35.24%) reported depressive symptoms and 50 (47.62%) were HIV-positive. Three Poisson regressions with robust variance (univariable, multivariable, and multivariable with depressive symptoms/study arm interaction) were modeled for three outcomes: CHTC, infant HIV testing, health-seeking postpartum. In multivariable analysis with interaction, a moderating trend for the interaction between depressive symptoms and individual health-seeking was observed (p-value = 0.067). Women scoring ≤ 9 (n = 68) on the PHQ-8 and participating in home visits were 1.76 times more likely to participate in individual health-seeking compared to participants in standard care (ARR 1.76, 95% CI 1.17–2.66).

Keywords Maternal health · HIV · Depressive symptoms · Home-based

Introduction

Couple HIV testing and counseling (CHTC), uptake of infant HIV testing, and maternal antenatal care are important behaviors for maternal health and prevention of mother-to-child transmission (PMTCT) of HIV [1–5]. CHTC has been found to promote HIV treatment and prevention behaviors, identify sero-discordant partners, and support maternal health practices even when one of the partners already knows their HIV-positive status [6–9]. Non-disclosure of HIV testing and infection status is associated with limited women's participation in PMTCT services and individual health-seeking, including postpartum clinic visits for women's health and HIV clinic services [10, 11].

Despite numerous interventions incorporating CHTC, many women in Kenya continue to have low rates of

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individual postpartum health-seeking, low participation in couple HIV testing, and inadequate rates of infant HIV testing [1, 4, 12–14]. Several studies have indicated that participants with poor mental health, particularly pregnant and postpartum women with depressive symptoms, may be less likely to participate in these critical health behaviors [11, 15–17]. An epidemiological study in Maseno, Kisumu District in Kenya found that the point prevalence of common mental disorders, including depression, was approximately 10.8% [18]. Depressive symptoms endemic within these populations may be exacerbated by the vulnerable antenatal period and within the context of highly prevalent HIV acquisition and transmission [19–21]. Notably, a study in rural Western Kenya indicated a prevalence of depression among pregnant women participants (n = 193) between 5.2 and 6.2%; a study in Zimbabwe indicated 39.4% of pregnant women participants (n = 198) living with HIV screened positive for antenatal depression [21, 22].

Depressive symptoms have been found to hinder access to care for pregnant women living with HIV, reduce HIV status disclosure, and limit participation in PMTCT services [15, 23]. Difficulties specific for women with an HIV positive diagnosis may compound the relative levels of depressive symptoms typically associated with pregnancy including: daily pill burdens, stigma, polygynous relationships, multiparity, and limited social support from the male partner [24–26]. A large prospective birth cohort study in west Africa also indicated that several factors increase the likelihood of maternal depression; such as, a pregnancy within two years of another birth, economic factors, and family stress including limited finances and intimate partner violence (IPV) [27].

Studies involving home-based CHTC are increasingly conducted and have indicated high rates of HIV testing, mutual status disclosure, and increased male involvement in the pregnancy period [8, 28, 29]. However, concurrent improvements in maternal and child health outcomes within home-based CHTC have not been consistently reported; including inconsistent results in facility delivery, antenatal care attendance, IPV, and postpartum family planning [8, 28]. While depressive symptoms have been identified within pregnant women in other HIV studies, the relationship between depressive symptoms during pregnancy, home-based interventions, CHTC, and HIV prevention health behaviors postpartum remains unclear [30, 31]. Therefore, the aim of this analysis is to estimate the potential moderating effects of maternal depressive symptoms on the effectiveness of a home-based couple intervention, including CHTC, for the uptake of HIV prevention health behaviors in pregnant/postpartum women living in Kenya.

Methods

Setting and Context

The Jamii Bora study, a home-based couple intervention for pregnant women and their male partners, was designed to promote CHTC, facilitate couple communication, and increase behaviors for PMTCT of HIV in southwestern rural Kenya [32]. Data for the analysis were obtained from the pilot study for Jamii Bora, conducted in Migori County, Kenya from 2014–2017. Pregnant women were recruited from antenatal care clinics (ANC) with the following inclusion criteria: at least 18 years of age, offered HIV testing at an ANC, in a stable relationship with a male partner for at least 6 months, currently living with a male partner, had not yet received CHTC with this male partner during this pregnancy, not yet disclosed her HIV status to her male partner, did not have a known HIV-positive partner, and gestational age less than 37 weeks [32]. Recruitment was conducted to ensure a sample of pregnant women of which approximately half were HIV-positive at baseline. A total of 105, of 127 randomized female participants, provided both baseline and follow-up data at 3 months after the birth and were included in this analysis; newly diagnosed HIV-positive women and women living with HIV prior to the index pregnancy were included. 109 women, of 250 screened, were not eligible to participate in the Jamii Bora study as they had already participated in CHTC with this male partner during this pregnancy, had already disclosed their HIV status to their male partner, or had a known HIV-positive partner. Women who reported severe IPV at baseline (n = 9) were excluded from the randomized portion of the study and from this analysis; but, they were retained in the overall study and were contacted for follow-up 3 months after giving birth. Additional details about the study recruitment process, formative work, intervention and pilot development can be found elsewhere [32].

This study was approved by the Institutional Review Boards of the University of Alabama at Birmingham and the Kenya Medical Research Institute. In addition, this study was supported by an independent safety monitoring committee, composed of members from Kenyan and international organizations.

Female participants were randomized into standard care or home visits for health education and couple relationship-building, and male partners were subsequently contacted for informed consent and study enrollment. In the standard care arm, participants were provided clinic-based ANC services and the option to participate in CHTC. Participants within both arms were provided standard letters of invitation for their male partners to join their wives in an ANC clinic. These standard ANC clinic visits included options for male

partners to participate in CHTC with their pregnant spouses and health education similar to the education provided to unaccompanied women. In the intervention arm, three couple home visits were conducted by lay health workers (two during pregnancy, one postpartum); these visits included an offer of home-based CHTC services, education in couple relationships and communication skills, family health information, and linkages to services provided through local healthcare clinics [32]. All female participants had tested at some point for HIV and almost all of the participants indicated that they were currently married. CHTC, as part of the intervention protocol, included HIV testing of both the women and the men, even if the woman had been tested and knew her HIV status. She was counseled and retested for HIV along with her male partner, as if she had not already been tested at the clinic. HIV-positive women participating in our previous study expressed a strong preference for this approach [9, 32]. CHTC uptake was achieved if CHTC was accepted and undertaken by the couple together at any point during the study observation period [32].

Analytical Method and Measures

Data collected for this analysis were obtained from questionnaires completed by all study participants at baseline, which occurred after their initial enrollment, and during follow-up three months after the birth of the baby. Depressive symptoms were screened via a validated 8-item measure, the Patient Health Questionnaire 8-item measure (PHQ-8), at baseline [33]. Studies conducted in western Kenya found that other PHQ versions (PHQ-9 and PHQ-2) were reliable scales for evaluating depressive symptoms among adults living with HIV [34, 35]. The PHQ-8 scale was utilized in this study because local referral services for participants scoring positive for depressive symptoms, as identified through the PHQ-8, were available for the study participants [32]. Depressive symptoms were considered to be present in women scoring 10 or higher on the PHQ-8; this scoring denotes an association with clinical depression and is consistent with scoring from another study in Africa evaluating depressive symptoms [33, 36, 37]. Thus, a dichotomous variable was created for participants that presented with PHQ-8 scores of ≥ 10 with a code of 1, responses that were scored at 9 or lower were coded as 0.

Three outcomes were selected for this analysis based on the aims of the Jamii Bora intervention to support HIV prevention health behaviors: participation in CHTC at any point during the study, uptake of infant HIV testing, and individual health-seeking postpartum. Participation in CHTC was assessed and verified at follow-up through the study follow-up questionnaire and couple visit form. A dichotomous variable was created for women who reported participating in CHTC within the follow-up form or visit form at any point during the observation period; affirmative responses were coded as 1. All other responses to this question were coded as 0. The woman was retested for HIV along with her male partner during CHTC, regardless of her previous testing or knowledge of her HIV status.

Uptake of infant HIV testing was operationalized as a dichotomous variable that indicated whether or not the woman took her child for infant HIV testing during the infant's clinic visit. Women participating in infant HIV testing were coded as 1 and those who did not participate were coded as 0. Infant HIV testing is routinely conducted only for HIV-exposed infants at 6 weeks, 6 months, and 12 months after the birth [38]. In case a woman seroconverted during the pregnancy or breastfeeding period, infants were treated as HIV-exposed infants and introduced into the PMTCT protocol.

Women's individual health-seeking postpartum was operationalized as a dichotomous variable with responses to the question 'Did you go to the hospital/clinic for a check-up for your own health after the birth': Yes, No, Refuse to answer. Responses of Yes were coded as 1 and responses of No were coded as 0. No responses of 'Refuse to answer' were reported by the participants. This variable was selected as an indicator of the woman's health-seeking postpartum because one of the three home visits was conducted approximately 6 weeks after birth. During this visit, the counselors emphasized the importance of individual health while also accessing and adhering to PMTCT and services at health care facilities. Utilization of postpartum services for maternal health, infant health services, use of PMTCT interventions at 3 months postpartum, and services for women living with HIV were separately assessed. Additionally, data were collected on birth outcomes for each infant (live birth, miscarriage, stillbirth) and other adverse events during the study period related to both male and female participants and infants. Couples ($n = 11$) that experienced an infant death or other severe adverse event after enrollment were discontinued from the study at that point and were not included in the analyses of health-seeking behavior after childbirth; including 1 miscarriage, 5 stillbirths, 2 maternal deaths, 3 neonatal/infant deaths [32].

The independent variables included commonly used control variables from previous studies involving HIV prevention health behaviors including age, level of education, parity, experience with IPV, and HIV status [39–41]. Age was measured as a continuous variable ranging from 18–39 years old. Level of education was dichotomized with participants who completed primary school coded as 1 and participants who had not completed primary school coded as 0. Parity was measured as a dichotomous variable with the participants indicating that this was their first pregnancy coded as 1 and all others coded as 0.

In addition, IPV is often associated with sub-optimal health behaviors, limited couple communication, and reduced infant HIV testing [42, 43]. Thus, IPV was included as an independent variable with women having experienced any IPV in their lifetime coded as 1 and 0 for all others. HIV status was obtained from the medical records of the participants. A dichotomous variable was created for participants with medical records indicating the participant was HIV-positive coded as 1 and HIV-negative coded as 0.

Poisson regressions with robust variance estimations were utilized for directly estimating relative risk for each of the three outcomes. These modified Poisson regressions with robust variance estimation models are recognized as producing similar results to log-binomial and logistic regression models for binary outcomes; however, the Poisson models are preferred for binary outcomes when the outcome is not rare, when convergence issues are present during log-binomial modeling, and to ensure robust error variance [44, 45]. Poisson regressions with robust variance estimation were thus conducted in a series of at least three models for each outcome. The first model was to evaluate univariable associations between each of the three outcomes and key independent variables. Significant or marginally significant (p-value < 0.10) independent variables from the univariable analyses were included in the subsequent multivariable Poisson models. Depressive symptoms and study arm variables were included in all multivariable analyses irrespective of significance within the univariable analyses. Two multivariable Poisson regression models with robust variance estimations were separately modeled for each of the three outcomes of interest: one with an interaction term between depressive symptoms and study arm and the other without the interaction term. All the analyses were performed using Stata/IC 15.1 for Mac.

Results

Descriptive statistics of the sample, including dependent and independent variables utilized in the Poisson regression models and stratified by study arm, are presented in Table 1. The sample included 52 participants in the standard care arm and 53 participants in the intervention arm (home visits). Of the 105 women included within this analysis, 35.2% (n = 37) presented at baseline with PHQ-8 scores ≥ 10 which were considered as screening positive for depressive symptoms. More than half of the participants had completed primary school (n = 63), approximately 15% (n = 16) were in their first pregnancy, and approximately 10% (n = 11) had ever experienced IPV. Approximately half of the participants were recorded as HIV-positive (n = 50).

Results from the univariable Poisson regression with robust variance estimation models for each of the three outcomes are presented in Table 2. The univariable analyses suggested that participants within the home visit intervention arm were significantly more likely to participate in CHTC (RR 2.77, 95% CI 1.62–4.76) and individual health-seeking postpartum (RR 1.43, 95% CI 1.03–1.97) when compared to standard care participants. In addition, experiencing IPV was associated with an increased likelihood of individual health-seeking postpartum (RR 1.58, 95% CI 1.22–2.04). As expected, a positive HIV status for the mother greatly increased the likelihood of infant HIV testing (RR 12.96, 95% CI 5.01–33.48); as 50 (47.62%) of the women were HIV positive and 55 (52.38%) were HIV negative. However, completion of primary school was associated with a decreased likelihood of infant HIV testing (RR 0.67, 95% CI 0.46–0.98). In these univariable models, depressive symptoms were not significantly associated with any of the three outcomes.

For the multivariable analysis of the CHTC outcome, the following independent variables were included in the Poisson regression model: IPV, study arm, and depressive symptoms. The results indicated that women who were enrolled in the home visit intervention arm were 2.8 times more likely to participate in CHTC than participants enrolled in the standard care arm after controlling for depressive symptoms and IPV (ARR 2.82, 95% CI 1.67–4.77). To further explore whether there were moderating effects of depressive symptoms on the intervention effects, an additional depression-by-study-arm interaction term was added to the same model with the IPV variable; however, the results of this analysis did not suggest significant moderating effects of depressive symptoms (Table 3). As IPV is frequently associated with depressive symptoms, an additional multivariable model with the depression-by-study-arm interaction term was created without the IPV variable [46]. However, no significant moderating effects of depressive symptoms were identified in the interaction model without IPV (Table 3).

Univariable analyses for the uptake of infant HIV testing indicated a highly significant relationship (p-value < 0.000) between infant HIV testing and the HIV status of the mother. A significant relationship between infant HIV testing and the mother's completion of primary school (p-value < 0.05) was also indicated. However, no significant relationships with intervention arm or depressive symptoms were identified in the multivariable analyses, with or without an interaction term between the study arm and depressive symptoms, when controlling for HIV status and education (Table 3).

For univariable analyses of the individual health-seeking postpartum outcome variable, study arm and IPV were found to be significantly associated with individual health-seeking postpartum and were included with depressive symptoms in the multivariable models. Within the multivariable Poisson regression with robust variance estimation model without the interaction term, IPV and study arm were both

significantly positively associated with individual health-seeking postpartum; such that, compared to participants within the standard care arm and holding other variables constant, participants within the home visit intervention arm were 1.42 times more likely to participate in individual health-seeking postpartum (ARR 1.42, 95% CI 1.04–1.94). Participants who had ever experienced IPV were also 1.58 times more likely to participate in individual health-seeking postpartum when compared to participants who had never experienced IPV, when holding other variables constant (ARR 1.58, 95% CI 1.19–2.11). Another multivariable model was created excluding the IPV variable; results from this model were similar, indicating that participants within the home visit intervention arm were 1.43 times more likely to participate in individual health-seeking postpartum (ARR 1.43, 95% CI 1.04–1.97).

To further explore whether there were moderating effects of depressive symptoms on the study intervention effects, an additional depression-by-study-arm interaction term was included in a second model with the same variables as the above multivariable individual health-seeking postpartum model. The results of this multivariable model with interaction term suggest potential moderating effects of depressive symptoms on study arm (p-value = 0.067) (Table 3). Thus, results for this interaction were stratified by depressive symptoms and were further illustrated with the use of a forest plot (Fig. 1). For participants screening negative for depressive symptoms (PHQ-8 < 10), those who participated in the home visit intervention study arm, when compared to

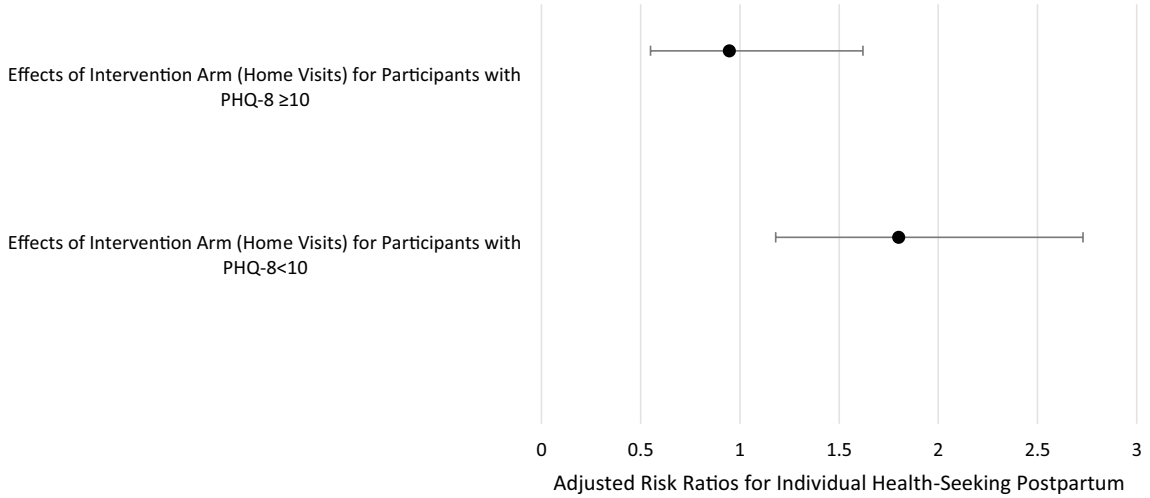

Fig. 1 Forest plot of adjusted risk ratios for the multivariable models of individual health-seeking postpartum stratified for participants with and without depressive symptoms

Table 1 Descriptive statistics of pregnant/postpartum Kenyan women by study arm

Variables	Standard care participants (n = 52) Mean (Std. Dev.)/N (Percent)	Home visit study arm (n = 53) Mean (Std. Dev.)/N (Percent)
Age in years (Range 18–39)	25.78 (6.27)	24.24 (5.21)
First pregnancy	8 (15.38%)	8 (15.09%)
Positive screen for depressive symptoms	18 (34.62%)	19 (35.85%)
Ever experienced IPV	5 (9.62%)	6 (11.32%)
HIV-status		
HIV-positive	24 (46.15%)	26 (49.06%)
HIV-negative	28 (53.85%)	27 (50.94%)
Completed primary school	32 (61.54%)	31 (58.49%)
Participated in couple HIV testing and counseling	12 (23.08%)	34 (64.15%)
Uptake of infant HIV testing	24 (47.06%)	28 (52.83%)
Individual health-seeking postpartum	26 (50.00%)	38 (71.70%)

Table 2 Univariable Poisson regressions with robust error variance estimation for the corresponding outcomes (n = 105)

Variable	CHTC		Infant HIV testing		Individual health-seeking postpartum	
	Unadjusted risk ratio (95% CI)	*p*-value	Unadjusted risk ratio (95% CI)	*p*-value	Unadjusted risk ratio (95% CI)	*p*-value
Age	0.971 (0.93–1.01)	0.181	1.022 (0.99–1.05)	0.127	0.995 (0.96–1.02)	0.770
First pregnancy (yes)	1.171 (0.67–2.02)	0.573	0.855 (0.47–1.55)	0.607	1.030 (0.67–1.56)	0.889
Study arm (yes-home visit)	2.779 (1.62–4.76)	0.000	1.122 (0.76–1.65)	0.559	1.433 (1.03–1.97)	0.028
Screened positive for depressive symptoms (yes-PHQ-8 ≥ 10)	0.889 (0.55–1.42)	0.625	0.958 (0.63–1.44)	0.839	0.962 (0.69–1.33)	0.820
IPV (yes-experienced in lifetime)	0.189 (0.02–1.25)	0.085	1.102 (0.61–1.96)	0.741	1.582 (1.22–2.04)	0.000
Participant's HIV status (yes-HIV positive)	0.846 (0.54–1.31)	0.458	12.96 (5.01–33.48)	0.000	1.170 (0.86–1.59)	0.314
Completed primary school (yes)	1.137 (0.72–1.79)	0.580	0.677 (0.46–0.98)	0.044	1.04 (0.75–1.42)	0.809

participants within the standard care arm, were 1.76 times more likely to participate in individual health-seeking postpartum (ARR 1.76, 95% CI 1.17–2.66). For participants screening positive for depressive symptoms (PHQ-8 ≥ 10): no significant intervention effects on individual health-seeking postpartum were identified.

Sensitivity analyses were conducted for the individual health-seeking outcome by excluding the IPV variable and stratifying the participants by depressive symptoms. For participants screening negative for depressive symptoms (PHQ-8 < 10), those who participated in the home visit intervention study arm, when compared to participants within the standard care arm, were 1.8 times more likely to participate in individual health-seeking postpartum (RR 1.8, 95% CI 1.18–2.73). For participants screening positive for depressive symptoms (PHQ-8 ≥ 10): no significant intervention effects on individual health-seeking postpartum were identified.

Discussion

The results from this pilot study suggest that the effects of a home-based intervention promoting CHTC were largely positive for women. These results are consistent with other studies investigating the effects of home-based interventions that have noted the strengths of incorporating home visits to foster couple relationships, support PMTCT of HIV, and promote testing for HIV [47–49]. Notably, a study in western Kenya evaluating the uptake of HIV and syphilis testing among pregnant women and their male partners participating in a home-based couple intervention suggested that male partners were more likely to test for syphilis and HIV if the testing was offered within the home [48]. Additionally, another study conducted in western Kenya indicated that home-based counseling and testing was successful in engaging participants in HIV testing but noted significant drop-offs for individual HIV care 3–4 years after being tested [49].

In our study, we observed a trend in which depressive symptoms may moderate the effects of the home-based intervention on individual health-seeking postpartum. These results suggest that there may be differences in the outcomes of women participating in the home visit intervention who report depressive symptoms during pregnancy compared to women who do not report depressive symptoms and participated in the home visits. A study conducted in Cape Town, South Africa and involving a home visit intervention suggested potential moderating effects of maternal depression on the quality of mother–child interactions [50]. The authors noted that maternal depression significantly moderated the effects of a home visit intervention on mother–child interactions; indicating that mothers in the home visit intervention and presenting without maternal depressed mood scored higher on a maternal-child interaction scale than mothers participating in standard care [50]. Alternatively, mothers with maternal depressed mood and participating in the home visit intervention did not demonstrate higher mother–child interaction scores than mothers with maternal depressed mood participating in standard care [50]. Another study conducted in Kenya, involving 141 maternal-child health clinics and cross-sectional surveys among 498 mother-infant pairs, indicated that women experiencing maternal depressive symptoms were less likely to access infant antiretroviral

Table 3 Multivariable Poisson regressions with robust error variance estimation for the corresponding outcomes with interaction

Outcome	Variable	Adjusted risk ratio (95% CI)	*p*-value
CHTC (n = 105)	IPV (yes-experienced in lifetime)	0.185 (0.02–1.17)	0.073
	Study arm (yes-home visit)	2.507 (1.36–4.60)	0.003
	Screened positive for depressive symptoms (yes-PHQ-8 ≥ 10)	0.693 (0.21–2.21)	0.538
	Depression-by-study-arm interaction term	1.498 (0.44–5.07)	0.516
CHTC (n = 105)	Study arm (yes-home visit)	2.444 (1.32–4.52)	0.004
	Screened positive for depressive symptoms (yes-PHQ-8 ≥ 10)	0.629 (0.19–2.05)	0.443
	Depression-by-study-arm interaction term	1.550 (0.44–5.43)	0.494
Uptake of infant HIV testing (n = 104)	Completed primary school (yes)	1.006 (0.83–1.20)	0.942
	Participant's HIV status (yes-HIV positive)	12.990 (5.04–33.47)	0.000
	Study arm (yes-home visit)	1.119 (0.95–1.30)	0.157
	Screened positive for depressive symptoms (yes- PHQ-8 ≥ 10)	0.987 (0.70–1.38)	0.941
	Depression-by-study-arm interaction term	0.914 (0.57–1.44)	0.702
Individual health-seeking postpartum (n = 105)	IPV (yes-experienced in lifetime)	1.563 (1.18–2.05)	0.001
	Study arm (yes-home visit)	1.771 (1.17–2.66)	0.006
	Screened positive for depressive symptoms (yes- PHQ-8 ≥ 10)	1.308 (0.78–2.19)	0.308
	Depression-by-study-arm interaction term	0.537 (0.27–1.04)	0.067
Individual health-seeking postpartum (n = 105)	Study arm (yes-home visit)	1.8 (1.18–2.73)	0.006
	Screened positive for depressive symptoms (yes- PHQ-8 ≥ 10)	1.385 (0.81–2.35)	0.229
	Depression-by-study-arm interaction term	0.526 (0.26–1.03)	0.064

prophylaxis than women without depressive symptom [51]. Our findings suggest that depressive symptoms among postpartum women may also limit individual health-seeking postpartum even when the women are participating in a home-based intervention.

Additionally, our multivariable analysis indicated that women who had ever experienced IPV were 1.58 times more likely to participate in individual health-seeking postpartum when compared to participants who had never experienced IPV (ARR 1.58, 95% CI 1.19–2.11); even when controlling for depressive symptoms and study arm. While a full evaluation of this result is beyond the scope of this article, additional analysis may be useful as these findings are inconsistent with studies in other low resource settings that suggest IPV may limit participation in individual health-seeking and ANC attendance [52, 53]. Additionally, larger studies may be useful to conduct more detailed analyses of the effects of IPV on health-seeking and ANC attendance during pregnancy in sub-Saharan African settings; as research indicates associations between IPV and critical HIV-prevention behaviors [54–56].

Of note, the uptake of infant HIV testing was significantly associated with maternal HIV status and completion of primary school; however, there were no significant relationships identified between the uptake of infant HIV testing and maternal depressive symptoms or study arm. These

results are consistent with another study in western Kenya in which a lack of knowledge was noted as a common barrier to the uptake of infant and mother HIV testing [57]. Kenyan national protocols, at the time of the study, recommended infant HIV testing for mothers with confirmed HIV-positive status and those with unknown HIV status (antibody test) [38]. Further studies may incorporate depression screening within home-based interventions to more fully explore the potential relationship between postpartum health-seeking, maternal mental health, uptake of infant HIV testing, and the potential of home-based interventions to minimize the impact of depressive symptoms on HIV prevention behaviors.

Limitations

There are several limitations associated with this analysis. The majority of data utilized in the study were self-reported through questionnaires. Self-reported data may be skewed due to individual levels of comfort regarding the topics, short recall periods, and misunderstandings of the questions asked [58, 59]. Mental health issues and HIV-related topics are particularly likely to be underreported or not reported due to the stigma associated with these conditions [58]. Thus, it is possible that the depressive symptoms were significantly underreported, although validation studies of the PHQ-9 and the PHQ-8 suggest its sensitivity and specificity, compared to gold standard mental health clinical tools (like the MINI), are quite strong [36, 60]. Also, considering that this analysis is based on data collected from a couples study, women choosing to participate in the study and willing to involve their male partner may be distinct from those who opted out [32]. Hence, loss-to-follow up and selection may have influenced the results of this analysis.

In addition, the small sample size of the pilot study utilized for this analysis limited the number of control variables, which may have potentially exaggerated the findings from these statistical models. A larger sample size and additional variables would more clearly define the relationship between women's participation in CHTC, individual health-seeking, infant HIV testing, and depressive symptoms in pregnant and postpartum women living in Kenya. These results also highlight the need for additional larger studies that can more thoroughly estimate the potential moderating effects of depressive symptoms on HIV prevention behaviors and the effects of depressive symptoms on health behaviors in general.

Conclusion

In summary, HIV prevention health behaviors in pregnant and postpartum women living in Kenya may be adversely associated with depressive symptoms and other mental health conditions. This recognition highlights a continual need to address mental health for rural populations in southwestern Kenya and a potential opportunity to improve HIV prevention health behaviors through early identification and treatment of depressive symptoms. In addition, as other pilot and full-scale intervention studies are implemented in rural Kenyan populations, providing access to mental health services for study participants may be a crucial point for addressing the needs of this population and supporting the uptake of HIV prevention health behaviors. Several studies have noted low-cost mental health interventions that have been implemented in similar settings; such as, incorporating lay health workers for cognitive behavioral therapy and task sharing among clinical providers [61, 62].

While the prevalence of depressive symptoms in pregnant and postpartum women is relatively well documented, the links between depressive symptoms during pregnancy, home-based interventions, and subsequent HIV prevention health behaviors should be further evaluated [63, 64]. Numerous factors are likely to influence individual health-seeking and couple HIV testing; thus, the observed trend of depressive symptoms reducing the likelihood of participation in individual health-seeking may suggest that one pathway to improving participation in HIV prevention behaviors within pregnant and postpartum women in Kenya is to address depression early during pregnancy and within the intervention implementation. Public health interventions aimed at improving HIV prevention health behaviors may benefit from incorporating screening and treatment options for maternal depressive symptoms among women living in Kenya [65]. Additionally, larger studies evaluating the effects of both depressive symptoms and home visit interventions may more fully clarify the effects of depressive symptoms on individual postpartum health-seeking.

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