Published in final edited form as:

AIDS Behav. 2018 October ; 22(10): 3188–3197. doi:10.1007/s10461-018-2153-y.

Correlates of Suicidal Ideation During Pregnancy and Postpartum Among Women Living with HIV in Rural South Africa

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Abstract

In developing countries, up to 20% of maternal deaths during pregnancy are due to suicide, and being HIV-infected confers additional risk. This manuscript sought to identify perinatal correlates of suicidal ideation among women living with HIV (WLHIV) in rural South Africa. Pregnant WLHIV (N = 681) were recruited and re-assessed at 12-months postpartum. Mean age was 28.3 (SD = 5.7) years and 68% were below the poverty line. Prenatal suicidal ideation was 39%; suicidal ideation continued for 7% at 12 months, 13% experienced incident suicidal ideation, and for 19% suicidal ideation had stopped postnatally. Intimate partner violence (AOR = 1.17) and depression (AOR = 1.14) predicted sustained suicidal ideation. Increased income (AOR = 2.25) and greater stigma (AOR = 1.33) predicted incident suicidal ideation. Younger age (AOR = 0.94), disclosure of HIV status to partner (AOR = 0.60), and greater stigma (AOR = 1.24) predicted postnatal cessation of suicidal ideation. Perinatal care may provide windows of opportunity for identification and treatment of suicidal ideation.

Keywords

HIV; Women; Pregnancy; Suicidal ideation; Intimate partner violence

Introduction

Although the introduction of antiretroviral therapy (ART) has greatly enhanced health and reduced AIDS-related mortality among people living with HIV globally [1, 2], suicidality—including suicidal ideation, suicide attempts, and completed suicides—remains elevated for

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Research Involving Animal Participants This article does not contain any studies with animals performed by any of the authors.

HIV-infected individuals in comparison with their HIV-uninfected counterparts in both developed and developing countries [3]. Risk factors for suicidal ideation in people living with HIV around the world, including those living in sub-Saharan countries, include younger age [4, 5], being unmarried [6–8], depression [5–7, 9–13], and non-disclosure of HIV status [8, 14].

The perinatal period, the time immediately surrounding child birth, and the postnatal period, literally, the time that follows child birth, both confer risk of suicidality. Although the overall rates of suicide attempts and completions worldwide are lower in perinatal women than in the general female population, suicidal ideation is higher in pregnant women than in the general population [15] and in developing countries, up to 20% of maternal deaths during pregnancy are due to suicide [16]. In addition to negative outcomes for mothers, maternal suicidal ideation, according to studies in the United States, may have negative effects on infants as well, such as a poorer mother-infant relationship [17] and lower birth weight [18]. Worldwide, risk factors for suicidal ideation during pregnancy and post-partum in women include lower educational attainment [15], depression [15, 19–21], younger age [19, 21], multiparousity [15, 20], and being unmarried [15, 19, 21]. In addition, characteristics of perinatal suicidality may differ from non-perinatal suicidality, and perinatal women who plan, attempt, or complete suicide are more likely than non-perinatal women to choose violent methods [13, 16, 19], suggesting greater intent [22–24]. These differences highlight the importance of understanding suicidality during this period.

South Africa has the eighth highest suicide rate in the world [25]. South Africa also has the greatest number of people living with HIV in the world [26], and pregnant women are greatly impacted by the HIV epidemic. In 2013, 29.7% of pregnant women attending antenatal clinics in South Africa were HIV-infected. Thus, women living with HIV (WLHIV) in South Africa may be particularly vulnerable to suicidal ideation, due to its association with both HIV infection and pregnancy.

Perinatal WLHIV in South Africa also face high rates of intimate partner violence (IPV), and IPV homicides account for half of the number of deaths among women of reproductive age [27–29]. The interpersonal-psychological theory of suicide (IPTS) posits that feelings of not belonging (*thwarted belongingness*) and of being a burden on others (*perceived burdensomeness*) can lead to suicidal ideation [30]. HIV stigma, even when not overtly enacted by others, may contribute to feelings of not belonging and of being a burden [31], and has been associated with suicidal ideation [11, 12, 32, 33]. The pathway from suicidal ideation to attempting suicide requires an *acquired capability* for suicide, which is characterized by an increased tolerance for pain and decreased fear of death [34]. Through habituation and strengthening of opposing responses to an intimate partner (*opponent processes*), IPV may increase pain tolerance and reduce fear of death, increasing the likelihood of suicidal ideation evolving into suicide attempts [34]. In combination with HIV-related feelings of not belonging and being a burden, IPV may greatly increase the risk of suicidal ideation [31], especially during pregnancy [15, 19–21, 35].

As perinatal WLHIV are particularly vulnerable, understanding factors that place these women at risk of suicidal ideation is especially important. This study examined perinatal

WLHIV in South Africa, hypothesizing that IPV and internalized HIV stigma would be associated with suicidal ideation. It was also theorized that during the perinatal period, risk factors for suicidal ideation could change, as postnatal women are especially likely to experience depression, i.e., postpartum depression [36]. This study further sought to identify risk factors for suicidal ideation in WLHIV during pregnancy, and to assess their evolution, including continued suicidal ideation into the postnatal period, as well as the emergence and cessation of postnatal suicidal ideation. It was anticipated that results could inform the development of intervention programs for identification and treatment of suicidal ideation for women in perinatal care.

Method

Study Design

Data for this study was drawn from a larger, longitudinal prevention of mother-to-child transmission (PMTCT) clinic-randomized controlled trial (RCT) with two antenatal (8–24 weeks and 32 weeks pregnant) and two postnatal (6 and 12 months) assessments. The RCT was conducted in 12 community health centers in Gert Sibande and Nkangala districts in Mpumalanga province, South Africa, with the aim of enhancing the uptake of the PMTCT protocol and male partner participation in the antenatal and postnatal process [37]. Study clinics were randomized to intervention or an enhanced control condition, and participants were enrolled in the arm to which their clinic was randomized. Both conditions have previously been described and are presented below [37].

Sample and Procedure

Eligibility was determined based on HIV-seropositivity in pregnant women between 8 and 24 weeks pregnant—the typical time of antenatal care initiation—being 18 years of age or older, and having a male partner. Participants were enrolled after provision of written informed consent. Assessments were administered via an audio computer-assisted self-interview (ACASI) system, which was anticipated to enhance disclosure and minimize social desirability bias, accommodate varying literacy levels, reduce interview bias, and was programmed to include one of three language preference settings. As such, the ACASI system was used to assess women in English or local languages (isiZulu, Sesotho). To introduce women to the system, participants completed the demographic section of the assessment with an assessor, who was then available nearby to assist the participant or answer questions on the remainder of the assessment as needed.

Ethical approval for the study was obtained from the Human Sciences Research Council (HSRC) Research Ethics Committee (REC), protocol approval REC4/21/08/13, the Department of Health and Welfare, Mpumalanga Provincial Government, and the University of Miami Miller School of Medicine Institutional Review Board (IRB ID: 20130238). The study was registered as a clinical trial on <https://clinicaltrials.gov/>, number NCT02085356; protocol details are presented in previous literature [37].

Intervention Condition

Intervention participants attended interactive group and individual sessions on PMTCT with a focus on male involvement during pregnancy in addition to the standard of care (standard of care PMTCT protocol). The intervention, “Protect Your Family”, is a manualized, closed structured behavioral risk-reduction program. The intervention was intended to optimize the prevention of vertical transmission, adherence to PMTCT and medication use, HIV testing of family members, prevention of HIV transmission and stigma, HIV serostatus disclosure, partner communication, IPV reduction, safe infant feeding, safer conception, family planning and dual method sexual barrier use; these individual elements have previously been described in detail [37]. The PMTCT intervention was facilitated by the study-trained clinic staff. Prenatally, prior to delivery, three weekly 2-h (between five and seven participants) group sessions were provided along with a subsequent postnatal session of individual or couples counseling. Postnatally, two monthly, individual or couples counseling sessions were provided.

Control Condition

The enhanced control condition participants attended video presentations on child health in addition to the PMTCT standard of care. The sessions were time-equivalent, the first three being group-administered video presentations on childhood disease prevention: (1) diarrhea management, dehydration and breast feeding, (2) infant nutrition, (3) immunization and sexual abuse, and were then followed by one individual or couples’ session on (4) fevers. Postnatally, two couples or individual video sessions were held on (5) burns, and (6) alcohol use.

Ethical Considerations

Research personnel received extensive training by three licensed clinical psychologists to refer women who disclosed suicidal ideation or IPV to locally based psychiatric nurses and social workers for assessment, hospitalization, or outpatient treatment [37]. Psychiatrists and psychologists at neighboring district hospitals were also available to provide further guidance and supervision to psychiatric nurses and social workers as needed. All women who disclosed IPV and suicidal ideation were counseled by psychiatric nurses and social workers. Risk management and treatment or crisis stabilization, when needed, was not provided by research personnel, and the final need and provision of treatment was determined by mental health professionals. Women reporting IPV or suicidal ideation were referred for assessment, hospitalization, or outpatient treatment regardless of whether their clinic was randomized to a control or intervention clinic.

Measures

Suicidal Ideation and Depression

The Edinburgh Postnatal Depression Scale 10 (EPDS-10), which has been validated for use during pregnancy and postnatally, was used to assess suicidal ideation and depression [38]. The EPDS-10 is a 10-item instrument that asks participants to rate how often they have experienced symptoms associated with depression in the past 7 days. Items are scored on a

scale of 0 through 3, ranging from “*never*” to “*yes, quite often*.” One item (“The thought of harming myself has occurred to me”) assesses suicidal ideation and has been found to have good sensitivity (77%) and excellent specificity (92%) for suicidal ideation in previous studies in South Africa [13]. Responses of “*Yes, quite often*”, “*Sometimes*”, and “*Hardly ever*” in the past week were coded as suicidal, and a response of “*Never*” as non-suicidal. This dichotomization has been used in previous research among pregnant women [13, 35, 39]. Research in South Africa [40] has reported adequate internal consistency for this scale ($\alpha = .80$). In this study, Cronbach’s alpha for the EPDS-10 scale at baseline was $\sigma = 0.73$ and $\sigma = 0.79$ at 12 months, suggesting adequate internal consistency at both timepoints. The rest of the items of EPDS-10, excluding the suicidal ideation item, were included as a total score for depression.

Sociodemographic, Reproductive, HIV, and Partner Characteristics

Sociodemographic factors assessed included age, education, employment status, income, relationship status and alcohol use. Reproductive issues included the number of children and planning of the current pregnancy [41]. HIV-specific issues included date of HIV diagnosis and HIV status of children and partner-specific issues evaluated HIV status of partner and partner use of ART [41].

Intimate Partner Violence

Intimate partner violence at baseline was measured using an adapted version of the Conflict Tactics Scale 18 (CTS-18) [42], which consists of a 9-item partner psychological IPV subscale ($\alpha = 0.76$), and 9-item partner physical IPV subscale ($\alpha = 0.92$). Respondents indicated the number of times in the past 4 weeks their partner had engaged in specific behaviors using a scale of 0 (Never) to 6 (More than 20 times). Analyses combined the mild and severe subscales. The CTS-18 does not measure sexual violence, and a measure of sexual violence or coercion was not included in the present study.

HIV Disclosure

Disclosure of HIV status to partner at baseline was evaluated using an adapted version of the Disclosure scale [43], which assesses disclosure of HIV status to partner using a dichotomous yes/no response option.

Internalized HIV Stigma

Baseline internalized HIV stigma was measured using the AIDS-Related Stigma Scale [44], a scale of nine-items, e.g., “People who have AIDS should be ashamed.” Items are scored as 0 (*Disagree*) or 1 (*Agree*). Scores range from 0 to 9, with higher scores indicating greater stigma. The reversed coded item for this scale (“It is safe for people who have AIDS to work with children”) was excluded given the scale’s poor internal reliability ($\alpha = 0.58$) when included. Excluding the item, reliability was adequate ($\alpha = 0.74$). After exclusion of the reversed-coded item, total scores of 0 and scores of 1 through 8 were dichotomized into 0 and 1, respectively, given that the most total scores (83%) were either 1 or 0.

Male Involvement

Male involvement at baseline was measured using the Male Involvement Index [37, 45], which is comprised of 11 items related to the participant's partner's antenatal involvement. Some of the items in this scale include, "Does your male partner attend antenatal care visits with you?" and "Have you discussed antenatal HIV prevention for your baby with your male partner?" Women responded to each item as 1 (Yes) or 0 (No), and scores ranged from 0 to 11. Cronbach alpha was 0.83 for this study, indicating adequate internal reliability.

Data Analysis

Univariate analyses consisted of descriptive statistics, such as means, standard deviations, frequencies and percentages. To compare non-suicidal participants versus suicidal participants, bivariate analyses were used and included t tests or its non-parametric alternative, the Mann–Whitney test, for continuous variables, and χ^2 tests for categorical variables. Multinomial logistic regression was used by comparing prenatal suicidal ideation prevalence with 12 months postnatal suicidal ideation. The categorical dependent variable consisted of four levels: women endorsing no prenatal and no postnatal suicidal ideation at 12 months follow-up (reference category), women endorsing prenatal and postnatal suicidal ideation at baseline and 12 months, women who did not endorse suicidal ideation at baseline but endorsed suicidal ideation at 12 months, and women who endorsed prenatal suicidal ideation at baseline but reported no longer endorsing postnatal suicidal ideation at 12 months followup. For parsimony, only variables found to be associated with suicidal ideation in bivariate analyses at $p < 0.05$ were included in the multivariable model. Condition (control or intervention) was controlled for in all analyses regardless of significance. Odds ratios with 95% confidence intervals were calculated as effect sizes for suicidal ideation [46]. All data analyses were conducted using Mplus (version 7.4) [47].

Results

Sample Characteristics at Baseline

At baseline, $N = 681$ pregnant WLHIV were enrolled; 59% of these women ($n = 403$) completed a 12 month postnatal assessment. Participant age ranged from 18 to 46 years (Mean = 28.5; SD = 5.8). Three-fourths (78%) had at least 10 years of education, 83% were unemployed, 50% had a monthly income of less than 600 South African Rand (~ USD\$49), 41% were married or cohabiting, and most women (80%) had one or more children. Approximately half of women (54%) were diagnosed with HIV in their current pregnancy, and 59% reported having disclosed their HIV status to their partner. Among women who reported having children, 5% knew that they had an HIV-infected child. A few (14%) women reported drinking two or more alcoholic beverages on at least one occasion in the past month (see Table 1). In bivariate analyses conducted at baseline, as summarized in Table 1, suicidal ideation was associated with increased psychological and physical IPV, increased depression, increased stigma, and nonadherence ($p < 0.05$).

Attrition Analyses

Attrition analyses indicated that participants with more education, those having children, and those who reported already having an HIV-infected infant (OR 0.64, $p < .10$) were less likely to drop out of the study; however, these variables were not associated with suicidal ideation, and as such were not included in analyses. Women's age, income, having an HIV-infected partner, disclosure of HIV serostatus to partner, and relationship status were not associated with attrition.

Suicidal Ideation Pre- and Postnatal

Prenatally, prior to delivery, the prevalence of suicidal ideation was 39%. Of those who experienced antenatal suicidal ideation, $n = 26$ (7%) continued to report suicidal ideation at 12 months, $n = 51$ (13%) began experiencing suicidal ideation and $n = 77$ (19%) who had experienced suicidal ideation reported that suicidal ideation had stopped postnatal; 62% ($n = 249$) did not report suicidal ideation at either time point (see Fig. 1). In multinomial logistic regression analyses, physical IPV and increased depression were related to sustained suicidal ideation, women endorsing suicidal ideation at baseline and then again at 12 months. Specifically, physical IPV increased the odds of experiencing suicidal ideation at baseline and 12 months by 17% (adjusted odds ratio (AOR) = 1.17 [1.02, 1.34]), and depression by 14% (AOR = 1.14 [1.09, 1.19]). Increased income (AOR = 2.25 [1.17, 4.36]) and greater stigma (AOR = 1.33 [1.06, 1.67]) predicted the emergence of suicidal ideation at 12 months among women who initially did not endorse suicidal ideation at baseline. Lastly, younger age (AOR = 0.94 [0.90, 0.99]), greater stigma (AOR = 1.24 [1.02, 1.46]), and disclosure of HIV status to partner (AOR = 0.60 [0.36, 0.94]) were related to the cessation of suicidal ideation at 12 months among women who were suicidal at baseline (see Table 2). Condition was not associated with any level of suicidal ideation.

Discussion

This study examined longitudinal changes in pre- and postnatal suicidal ideation and identified predictors of suicidal ideation, hypothesizing that stigma and IPV would be associated with increased suicidal ideation. Suicidal ideation was most likely to present and be sustained among women experiencing physical IPV, and most likely to diminish among younger women reporting HIV status disclosure to partners, despite increased stigma. Results are consistent with previous studies in which physical IPV predicted the development of suicidal ideation [48, 49], and underscore the importance of IPV and stigma reduction and of interventions to support HIV disclosure in the perinatal setting.

Results support previous research [11, 12, 32, 33] in which stigma was associated with increased suicidal ideation. HIV-related stigma may have increased feelings of social rejection associated with HIV infection, which may have increased feelings of not belonging and being a burden, consistent with the interpersonal-psychological theory of suicide (IPTS) [34]. Such feelings may have been exacerbated by the perpetration of violence at the hands of an intimate partner, particularly during later stages of pregnancy, when physical limitations related to pregnancy may have been more of a concern for these women. In addition, the exposure to violence or the threat of violence may further lead to habituation to

physical pain or fear which increases the *capability for suicide* according to the IPTS, suggesting a need for suicide risk assessment during the perinatal period [30]. As previously discussed, the IPTS is based on the premise that feelings of not belonging and of feeling like a burden to others can lead to suicidal ideation [30]. Combined with greater exposure to violence and other painful experiences—referred to as a greater *acquired capability for suicide*—these feelings can lead to death by suicide [30].

Disclosure of HIV status to partners contributed to the cessation of suicidal ideation, consistent with previous research on the protective effects of HIV status disclosure against suicidal ideation [8, 14] and with the IPTS [30]. It is possible that the high prevalence of HIV among pregnant women in South Africa may have increased feelings of belongingness, which may have motivated women to disclose their HIV status, which may have in turn decreased suicidal ideation [26, 31]. However, women disclosing their HIV status receive both supportive and unsupportive reactions from their partners, including IPV, which may increase or decrease suicidal ideation [31]. Partner-specific reactions to HIV status disclosure in this sample were not assessed but should be evaluated in future research.

Though the impact of IPV on depression and suicidal ideation has been well established and suicidal ideation is often a symptom of depression [50], in this study, depression contributed to ongoing suicidal ideation but was not the trigger for its emergence. This highlights the importance of evaluating suicide risk even among those with low or moderate risk of pre- or postnatal depression and suggests that suicidal ideation may be a transdiagnostic construct—a construct that applies across a number of mental disorders, rather than depressive disorders or clusters of depressive symptomatology alone. Therefore, suicidal ideation may represent a precursor for depression in the presence of other risk factors, such as stigma and IPV. Interestingly, suicidal ideation was not associated with infant HIV status, though the small numbers of women having an HIV-infected infant may have precluded detection of a relationship. Finally, the impact of miscarriage and infant mortality on suicidal ideation could not be assessed as all mothers dropped out of the study when they miscarried, or when their infant died before the 12-month assessment. Future studies should evaluate the effect of miscarriage and infant mortality on suicidal ideation [51] and the potential for interventions to prevent maternal death by suicide [16].

In this study, incident ideation referred to the emergence of suicidal ideation during the perinatal period during which women were assessed. Unexpectedly, women with greater income were more likely to become suicidal by 12 months postpartum; these women may have been less likely to disclose their HIV status to partners, family, and community members, increasing feelings of hopelessness associated with suicidal ideation, although incident suicidal ideation was not associated with HIV status disclosure to partner. However, this may have been due to the low rate of incident suicidal ideation, which may have precluded the detection of a significant effect; this should be addressed in future studies with larger sample sizes. Income may also represent an indirect effect of the degree of financial involvement linked to male partners, although no associations between incident suicidal ideation and partner-related factors were identified. Though social support is protective against suicidal ideation [5, 50, 52–54], male involvement did not have a protective effect against incident suicidal ideation in this sample; male partner involvement may take a

negative form in relationships with IPV. HIV infection is often accompanied by rejection by significant others, family, or community members, and social relationships may not be as protective for HIV-infected women [31]. It is likely that the measure used in this study may not have captured the full extent of male involvement, or that it captured a specific quality of male involvement that was not associated with suicidal ideation. It is also possible that effect of male involvement on suicidal ideation may have been too small to be detected by the sample size of the present study.

Limitations

Interpretation of study results is limited by high levels of attrition, which may be associated with increased depression at follow-up, though not at baseline. Additionally, results relied upon self-reported measures, which are prone to social desirability bias, though ACASI was used to reduce bias [55]. Suicidal ideation was also assessed using one item, although it has been found to have adequate sensitivity and specificity for detecting suicidal ideation [13]. More comprehensive tools could be used to measure suicidal ideation and related constructs, such as non-suicidal self-injury, suicide attempts, or the acquired capability of suicide potentially resulting from experiencing IPV [56]. Lastly, the results are limited by the low prevalence of WLHIV endorsing suicidal ideation at both baseline and 12-months (stable suicidal ideation).

Future Research

Results point to several avenues for future research. Strategies for the implementation of interventions specific to suicidal ideation, in addition to depression, should be considered for women in perinatal care, and should include methods to identify suicidality. Additionally, culturally sensitive measures of HIV disclosure, partner involvement, and social support may be needed to assess the complex paths between these factors and suicidal ideation in women living with HIV. Finally, as the effects identified in this study ranged from small to moderate, more robust predictors of suicidal ideation remain unknown, which may be due to the absence of theoretical clarity, guidance, and understanding of suicidal ideation, behavior, and suicide within the South African context. Testing aspects of the IPTS [34] in the South African context may help identify these robust contributors, or help to develop alternative theories to explain suicidal ideation and behavior in this group. The development of alternative theories may thereby provide a framework to facilitate the advancement and improvement of targeted interventions for perinatal women.

Conclusion

This study examined suicidal ideation in pregnant and postpartum WLHIV, and found physical IPV to be a contributor to sustained suicidal ideation, highlighting the likely contribution of IPV to the capacity for suicidality and the risk of suicide [56]. Results highlight the importance of assessment of depression and suicidal ideation during and following pregnancy, and of the implementation of interventions to reduce IPV in this vulnerable population. Clinic initiatives targeting PMTCT that increase women's exposure to others living with HIV, as well as those with HIV-infected infants, may contribute to

feelings of belonging, reducing suicidal ideation [26, 31]. Similarly, because disclosure of HIV status to partners was related to the cessation of suicidal ideation among this group of WLHIV, it is possible that interventions aimed at increasing HIV status disclosure may help reduce suicidal ideation [8, 14]. Lastly, in South Africa, there is an increased risk of mortality among women of reproductive age experiencing IPV, and this study highlights one path by which IPV may contribute to increased mortality by increasing the risk for suicide [29].

Acknowledgments

Funding This study was funded by NICHD/NIH Grant No. R01HD078187 and with support from P30AI073961. Part of the manuscript was carried out under a Ford Foundation Fellowship to Violeta J. Rodriguez.

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Fig. 1.
Categories of change in suicidal ideation during pregnancy to 12 months post-partum

Table 1

Suicidality by socioeconomic, reproductive, HIV, partner and mental health characteristics prenatal at baseline (N = 681)

Characteristic	All (N = 681) Mean (SD) n (%)	Not Suicidal (n = 415) Mean (SD) n (%)	Suicidal (n = 266) Mean (SD) n (%)	p
Socioeconomic status				
Age	28.47 (5.75)	28.64 (5.56)	28.02 (5.93)	– 1.63, 0.103 ^a
Education				
Grade 0–9	148 (21.7%)	81 (19.5%)	67 (25.2%)	3.73, 0.155
Grade 10–11	339 (49.8%)	208 (50.1%)	131 (49.2%)	
Grade 12 or more	194 (28.5%)	126 (30.4%)	68 (25.6%)	
Employed				
No	562 (82.5%)	338 (81.4%)	224 (84.2%)	0.86, 0.354
Yes	119 (17.5%)	77 (18.6%)	42 (15.8%)	
Monthly household income (South African Rand)				
< 600 (~ \$50)	337 (49.5%)	200 (48.2%)	137 (51.5%)	0.71, 0.399
600	344 (50.5%)	215 (51.8%)	129 (48.5%)	
Relationship status				
Unmarried, living separate	403 (59.2%)	244 (58.8%)	159 (59.8%)	0.34, 0.845
Unmarried, living together	153 (22.5%)	92 (22.2%)	61 (22.9%)	
Married	125 (18.4%)	79 (19.0%)	46 (17.3%)	
Reproductive issues				
Number of children				
None	139 (20.4%)	87 (21.0%)	52 (19.5%)	0.20, 0.655
One or more	542 (79.6%)	328 (79.0%)	214 (80.5%)	
HIV issues				
Diagnosed during this pregnancy				
No	314 (46.1%)	195 (47.0%)	119 (44.7%)	0.33, 0.565
Yes	367 (53.9%)	220 (53.0%)	147 (55.3%)	
HIV status of children				
Negative/do not know	513 (94.6%)	309 (94.2%)	204 (95.3%)	0.32, 0.571
Positive	29 (5.4%)	19 (5.8%)	10 (4.7%)	
Partner issues				
Disclosure of serostatus (to partner)				
No	279 (41.0%)	194 (39.3%)	85 (45.5%)	2.14, 0.143
Yes	402 (59.0%)	300 (60.7%)	102 (54.5%)	
HIV serostatus of spouse/partner				
Negative/do not know	510 (74.9%)	306 (73.7%)	204 (76.7%)	0.75, 0.385
Positive	171 (25.1%)	109 (26.3%)	62 (23.3%)	
Male involvement	7.11 (3.07)	7.22 (3.06)	6.92 (3.07)	– 1.393, 0.164
Psychological intimate partner violence	3.24 (5.31)	2.54 (4.80)	4.32 (5.87)	– 5.55, < 0.001 ^a
Physical intimate partner violence	1.15 (3.68)	0.66 (2.71)	1.91 (4.72)	– 5.63, < 0.001 ^a

Characteristic	All (N = 681) Mean (SD) n (%)	Not Suicidal (n = 415) Mean (SD) n (%)	Suicidal (n = 266) Mean (SD) n (%)	p
Depression	10.82 (6.26)	9.92 (5.20)	15.12 (4.07)	13.76, < 0.001
Alcohol use, stigma, adherence, and sexual risk behaviors				
Alcohol (> 2 drinks last month)				
No	587 (86.2%)	364 (87.7%)	223 (83.8%)	2.05, 0.152
Yes	94 (13.8%)	51 (12.3%)	43 (16.2%)	
Stigma	0.77 (1.36)	0.60 (1.19)	1.05 (1.56)	– 4.95, < 0.001
Study condition				
Standard of care	345 (50.7%)	221 (53.3%)	124 (46.6%)	2.87, 0.091
Enhanced intervention	336 (49.3%)	194 (46.7%)	142 (53.4%)	

Bold values are statistically significant ($p < 0.05$)

^aMann–Whitney tests were used for median comparison of groups and χ^2 tests for differences in proportions

Table 2

Multinomial logistic regressions with “Stable no suicidal ideation” (prenatal and 12 months postnatal) as reference group (n = 249)

	Stable suicidal ideation (n = 26)		Change to suicidal ideation (incident suicidal ideation) (n = 51) ^d		Change to no suicidal ideation (n = 77)	
	OR [95% CI]	AOR [95% CI]	OR [95% CI]	AOR [95% CI]	OR [95% CI]	AOR [95% CI]
Fixed effects						
Intervention	1.83 [0.81, 4.13]	0.999 [0.66, 1.52]	0.89 [0.49, 1.60]	1.01 [0.54, 1.89]	1.32 [0.80, 2.17]	1.35 [0.79, 2.31]
Covariates (baseline)						
Age	0.99 [0.92, 1.06]	–	1.03 [0.98, 1.09]	–	0.94 [0.90, 0.98] ^{**}	0.94 [0.90, 0.99] [*]
Educational attainment (ref = up to 10 years)						
10–11 years	2.48 [0.71, 8.70]	–	1.09 [0.50, 2.38]	–	1.04 [0.55, 1.95]	–
12 years or more	1.46 [0.35, 6.00]	–	1.09 [0.46, 2.55]	–	0.72 [0.35, 1.49]	–
Monthly income	0.83 [0.37, 1.83]	–	1.94 [1.05, 3.57] [*]	2.25 [1.17, 4.36] [*]	0.88 [0.54, 1.45]	–
Relationship status (ref = unmarried, living separate)						
Unmarried, living together	0.63 [0.21, 1.94]	–	0.71 [0.31, 1.61]	–	0.91 [0.48, 1.72]	–
Married	0.76 [0.25, 2.33]	–	1.24 [0.59, 2.60]	–	–	–
Children	2.74 [0.63, 11.85]	–	1.42 [0.61, 3.30]	–	–	–
Diagnosed during this pregnancy	0.97 [0.44, 2.16]	–	0.93 [0.52, 1.67]	–	1.14 [0.69, 1.87]	–
HIV positive children	1.38 [0.30, 6.30]	–	1.09 [0.31, 3.88]	–	0.44 [0.10, 1.93]	–
HIV positive partner	1.73 [0.76, 3.94]	–	1.13, 0.59, 2.15]	–	0.85 [0.48, 1.50]	–
Alcohol use	1.19 [0.39, 3.59]	–	1.03 [0.44, 2.43]	–	0.96 [0.46, 2.00]	–
Stigma	1.09 [0.83, 1.44]	–	1.19 [0.98, 1.44] [^]	1.33 [1.06, 1.67] [*]	1.16 [0.98, 1.38] [^]	1.24 [1.02, 1.46] [*]
Disclosure of HIV status to partner	1.08 [0.48, 2.45]	–	1.15 [0.63, 2.11]	–	0.63 [0.38, 1.04] [^]	0.60 [0.36, 0.94] [*]
Male involvement	0.94 [0.83, 1.07]	–	1.01 [0.92, 1.11]	–	0.96 [0.88, 1.03]	–
Psychological IPV	1.08 [1.02, 1.13] ^{**}	1.00 [0.96, 1.05]	0.99 [0.95, 1.05]	–	1.03 [0.99, 1.08]	–
Physical IPV	1.09 [1.02, 1.18] [*]	1.17 [1.02, 1.34] [*]	1.03 [0.95, 1.10]	–	1.05 [0.98, 1.12]	–
Depression	1.18 [1.09, 1.29] ^{***}	1.14 [1.09, 1.19] ^{***}	0.97 [0.92, 1.03]	–	1.01 [0.93, 1.09]	–
Model fit						
– 2LL (Deviance)	– 399.67		– 131.41		– 170.51	
Number of Parameters	7		4		5	
AIC/BIC	813.99/841.99		270.83/285.64		351.01/369.95	

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IPV: intimate partner violence, *AOR* adjusted odds ratio

^a Incident suicidal ideation refers to the emergence of suicidal ideation during a specified period of time

*** $p < 0.001$,
** $p < 0.01$,
* $p < 0.05$,
^ $p > 0.10$