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Male Partner Participation in Antenatal Clinic Services is Associated with Improved HIV-free survival Among Infants in Nairobi, Kenya: A Prospective Cohort Study

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Abstract

Objective—This prospective study investigated the relationship between male antenatal clinics (ANC) involvement and infant HIV-free survival.

Methods—From 2009-2013, HIV-infected pregnant women were enrolled from six antenatal clinics (ANC) in Nairobi, Kenya and followed with their infants until six weeks postpartum. Male partners were encouraged to attend antenatally through invitation letters. Males who failed to

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attend had questionnaires sent for self-completion postnatally. Multivariate regression was used to identify correlates of male attendance. The role of male involvement in infant outcomes of HIV infection, mortality and HIV-free survival were examined.

Results—Among 830 enrolled women, 519 (62.5%) consented to male participation and 136 (26.2%) men attended the ANC. For the 383 (73.8%) women whose partners failed to attend, 63 (16.4%) were surveyed via outreach. In multivariate analysis, male report of prior HIV testing was associated with maternal ANC attendance (aOR=3.7; 95% CI:1.5-8.9, p=0.003). Thirty-five (6.6%) of 501 infants acquired HIV or died by six weeks of life. HIV-free survival was significantly greater among infants born to women with partner attendance (97.7%) than those without (91.3%) (p=0.01). Infants lacking male ANC engagement had an approximately 4-fold higher risk of death or infection compared to those born to women with partner attendance (HR=3.95, 95% CI:1.21-12.89, p=0.023). Adjusting for antiretroviral use, the risk of death or infection remained significantly greater for infants born to mothers without male participation (aHR=3.79, 95% CI:1.15-12.42, p=0.028).

Conclusions—Male ANC attendance was associated with improved infant HIV-free survival. Promotion of male HIV testing and engagement in ANC/PMTCT services may improve infant outcomes.

Keywords

Male partners; vertical transmission; HIV; infant mortality; sub-Saharan Africa

Introduction

Vertical transmission of human immunodeficiency virus (HIV) accounts for more than 200,000 new infections in children each year, with 90% of those occurring in sub-Saharan Africa.^{1,2} Although progress towards the goal of virtual elimination of mother-to-child transmission of HIV (MTCT) has been made, substantial gaps persist in resource limited settings.³ Antiretroviral (ARV) utilization remains suboptimal in many countries, in which up to half of HIV-infected pregnant women and their infants fail to receive appropriate therapies.³⁻⁵ Infant mortality rates in sub-Saharan Africa are among the highest in the world and are perpetuated by vertical transmission of HIV, infant feeding practices, and socioeconomic factors.⁶⁻⁸ To improve child health outcomes, interventions that address both prevention of mother-to-child transmission of HIV (PMTCT) and child survival in a family-centered manner are needed.⁹⁻¹¹

Male partner engagement through attendance and participation in antenatal clinic (ANC) services has been associated with enhanced uptake of PMTCT. Specifically, male partner engagement has been associated with improvements in maternal HIV testing, uptake of care and adherence to ARV treatments and feeding strategies by HIV-infected women.^{9,12-18} There are limited and inconsistent data demonstrating the translation of these effects into survival outcomes in children. Data from a Kenyan cohort demonstrated that male ANC involvement and voluntary counseling and testing for HIV (VCT) were associated with reduced vertical transmission and mortality among infants, resulting in an approximately two-fold increase in HIV-free survival.¹⁹ In a study from Papua New Guinea, there were

significantly higher risks of infant deaths, HIV infections, or loss to follow-up if women lacked a partner, or reported that their male partners had not been HIV tested or had an unknown HIV testing status.²⁰ However, subsequent research from Malawi failed to detect lower vertical transmission risks with male partner involvement in PMTCT services.²¹

Although international guidelines call for male participation in ANC/PMTCT services, achieving involvement has been difficult in high HIV burden regions with engagement ranging from 5-76% in research settings.^{16,19,22-26} Numerous methodologies including community sensitization, formal invitations, community based partner tracing, development of male-friendly clinic environments and varying VCT models have been used to attempt to improve partner involvement.^{19,23,25,27-31} These attempts have not resulted in consistently augmented ANC participation. Thus, lack of male engagement may undermine implementation of PMTCT and child survival strategies. This nested prospective cohort study aimed to assess the impact of partner ANC engagement on infant health outcomes of children born to HIV-positive women.

Subjects and Methods

Ethics statement

The Ethical Review Committee at the Kenya Medical Research Institute granted approval for human subjects research for this work. Informed written consent was obtained from all female and male participants prior to enrollment and data collection.

Study Design and Procedures

HIV-positive pregnant women were recruited from six antenatal clinics in Nairobi, Kenya from 2009 to 2013 and followed with their infants until six weeks postpartum in a prospective study assessing breastfeeding practices as previously described.³² A nested cohort study was undertaken to assess the role of male partner engagement in infant outcomes. All study clinics were Ministry of Health-affiliated and served similar low-income urban populations in Nairobi, Kenya. HIV-positive women were eligible for participation if they were 18 years of age or older, at least 30 weeks gestation, had an intention to breastfeed and planned to deliver and remain in Nairobi after delivery. Women were enrolled and followed weekly until delivery and then seen at one and six weeks postpartum with their infants. At enrollment, a standardized questionnaire was administered assessing maternal health, sociodemographics and partnership characteristics. Interval maternal-fetal health information was obtained at each clinic visit.

All female participants were screened for consent of partner involvement. If women consented, men were encouraged to attend through formal invitation letters sent via their partners during the antenatal period. Standardized questionnaires obtaining data on sociodemographics, HIV testing, ANC attendance, HIV knowledge and partner PMTCT discussions were collected from all enrolled male participants. Males who failed to attend antenatally were provided similar questionnaires for self-completion, which were returned by their enrolled female partner in sealed envelopes during the postnatal period. Male partners who attended the ANC and took part in PMTCT services were eligible for VCT at

their discretion performed by study nurses trained in couples VCT services. Men found to be HIV-infected were referred for ARV therapy to HIV comprehensive care clinics on site, per national guidelines.³³ The PMTCT programming which the male partners received was the same as that provided to the enrolled pregnant women but in the presence of male partner interactive discussion with the trained research nurse on HIV knowledge and vertical transmission prevention was provided.³²

At enrollment, maternal venous blood was obtained for CD4 cell counts. Women were referred for ARV therapy as per Kenyan national treatment guidelines and PMTCT ARV prophylaxis was provided to all women and infants. Blood samples from infants were collected via a heel prick at six weeks of life on a filter paper and dried blood spots obtained. DNA was extracted from the samples to determine infant infection status using HIV-1 DNA polymerase chain reaction (PCR) assays. PCR testing was performed at the Kenya Medical Research Institute (KEMRI) as part of the standard national infant testing protocols. Infants found to be HIV-infected were referred for ARV therapy, per national guidelines.³⁴

Statistical Methods

Data analysis was performed using STATA version 11.0 (StataCorp; College Station, USA). Participant characteristics were explored using frequencies with percentages for categorical variables and means and medians with standard deviations (SD) or interquartile ranges (IQR) for continuous parameters. Correlates of male attendance were compared using independent sample *t* tests or Mann-Whitney U tests for continuous variables and Pearson χ^2 or Fisher's exact tests for categorical variables. Odds ratios (OR) with 95% confidence intervals (95% CI) for factors associated with male ANC attendance were derived using multivariate logistic regression. Models were built in a forward stepwise manner with significance levels for addition and removal set at *p* values of 0.10 and 0.05 respectively.³⁵ Covariates used in the models were derived from data gathered from male partners only.

The role of male involvement in the infant outcomes of HIV infection, mortality and HIV-free survival (representing the combined risk of HIV infection or infant mortality) were examined using prevalence and incidence rates. The outcomes of mortality and HIV-free survival were explored using Kaplan-Meier analyses with significant differences in time to events assessed using log-rank tests. Cox proportional hazards models were undertaken to evaluate the effects of male partner involvement on the outcomes of mortality and HIV-free survival yielding hazards ratios (HR) and adjusted hazards ratios (aHR). Multivariate hazards models were adjusted *a priori* for maternal and infant ARV use. The covariates of maternal CD4 cell counts, exclusive breastfeeding (EBF) adherence and clinic site were evaluated through likelihood ratio testing and found not to significantly contribute to the multivariate model and were excluded (*p*>0.05 for all parameters).

In vertical transmission analyses the midpoint between birth and testing was used as the time of event. HIV-uninfected infants were censored at time of death, last follow-up visit or at six weeks postpartum. In mortality analyses, time of infant death was based on clinic records and maternal report. Event time for stillborn infants was set as immediately postpartum. Live infants were censored at their last follow-up or at six weeks postpartum. For HIV-free survival, timing of events was first based on HIV infection and subsequently on mortality as

described above. Live, HIV-uninfected infants were censored at their last clinic visit or at six weeks postpartum.

Results

Study population

Among 830 enrolled women, 519 (62.5%) consented to male involvement. There were 93 (11.2%) women who reported no current male partner and 218 (25.9%) who refused partner participation; these were excluded from the analysis. For the eligible male partners 136 (26.2%) attended the ANC. Among the remaining 383 male partners who failed to attend the ANC, 63 (16.4%) were surveyed via postnatal sampling (Figure 1). A total of 499 (96.1%) mother-infants were followed prospectively until six weeks postpartum with a cumulative follow up time of 54.14 person-years. There were 132 (26.5%) and 367 (73.5%) infants born to women with and without male ANC engagement, respectively.

Male ANC attendance

For sampled male partners there were no significant differences in age, level of education or employment status, among those that did versus did not attend the ANC (Table 1). Men who reported prior HIV testing and couples VCT were more likely to attend the ANC in univariate analysis. Men who were aware that MTCT was possible were also more likely to present to ANC. Supportive partnership and open relationship disclosure characteristics inclusive of being in a monogamous relationship, men reporting awareness that their female partners were HIV-positive and having discussed PMTCT interventions with their pregnant partners were all significantly associated with male ANC attendance (Table 1). In multivariate analysis only male report of prior HIV testing remained significantly associated with ANC engagement (adjusted odds ratio [aOR]=3.7; 95% CI: 1.5-8.9, $p=0.003$).

Among all sampled women in the cohort, the mean age was 27.3 (± 5.2) years and the median CD4⁺ cell count was 405.0 (Interquartile range [IQR]: 285.8, 574.4) cells/ μ l. The median gravidity was 2 (IQR: 1, 2) and 14.8% of women reported being nulliparous. No differences between maternal infant pairs with and without male ANC involvement existed based on clinic site, socioeconomic characteristics, maternal CD4⁺ cell counts, maternal or infant ARV uptake or EBF adherence. Maternal report of partner discussion of PMTCT services and awareness of their partners' HIV serostatus was also not found to be significantly associated with male attendance. Women in monogamous relationships and those reporting that their partners had been previously tested for HIV were significantly more likely to have male ANC engagement (Table 2).

Infant outcomes

Vertical Transmission—Overall, there were 12 infant infections, with 1 (0.8%) among infants born to mothers with male ANC involvement versus 11 (3.0%) infections among infants born to mothers without male ANC involvement ($p=0.197$). The corresponding incidence of infection for infants born to women with male attendance was 6.7/100-person-years (95% CI: 0.9-47.7) versus 28.0/100-person-years (95% CI: 15.5-50.6) among those born to mothers without partner attendance ($p=0.136$) (Tables 2 and 3).

Mortality—Infant mortality was significantly lower for those with mothers whose partners attended ANC, with 2 (1.5%) deaths among the 132 women with male ANC involvement versus 21 (5.7%) deaths among the 367 women without male involvement ($p=0.053$) (Table 2). The mortality incidence was 13.4/100-person-years (95% CI: 3.4-53.8) in the male ANC attendance group as compared to 53.5/100-person-years (95% CI: 34.9-82.1) for infants in the group lacking male attendance (Table 3).

Infant survival at six weeks of life is depicted in the Kaplan-Meier survival plot (Figure 2a) and was significantly greater for those children born to mothers with male ANC involvement ($p=0.049$). In Cox regression models infants born to women without male attendance showed a trend toward reduced survival (HR=3.83, 95% CI: 0.90-16.33; $p=0.070$), which was maintained when adjusting for maternal and infant ARV use (aHR=3.73, 95% CI: 0.87-15.94; $p=0.077$).

HIV-free survival—HIV-free survival was significantly greater with male partner ANC involvement. For the combined outcome there were 3 (2.3%) events occurring in the group of infants born to mothers with male ANC attendance versus 32 (8.7%) for those born to mothers lacking partner participation (Table 2). This resulted in an incidence of 20.2/100-person-years (95% CI: 6.5-62.5) in the male involvement group as compared to 81.5/100-person-years (95% CI: 57.6-115.3) for infants born to women without male ANC participation through six weeks postpartum (Table 3).

Six week HIV-free survival is illustrated in the Kaplan-Meier plot (Figure 2b) and was found to be significantly greater among infants born to mothers with male ANC involvement as compared to those without ($p=0.014$). In Cox regression models, infants born to women lacking male attendance had a significantly higher risk of the combined outcome (HR=3.95; 95% CI: 1.21-12.89; $p=0.023$). Adjusting for maternal and infant ARV use, the combined risk for either vertical transmission or mortality was approximately four fold greater among those without male antenatal involvement (aHR=3.79; 95% CI: 1.15-12.42; $p=0.028$) (Table 3).

Discussion

Although progress towards virtual elimination of MTCT has been made, a substantial burden of infant HIV infection and mortality persists in sub-Saharan Africa.^{3,5,6,36} Male partner engagement in ANC/PMTCT services may improve these outcomes.^{9,30} In the present study, infants born to HIV-infected women with male partner ANC attendance had greater HIV-free survival through six weeks postpartum than infants born to women without male involvement. Men were more likely to participate in ANC programs if they had previously been exposed to HIV testing services. These findings support investment in programs aimed at enhancing male HIV testing and ANC engagement to improve child health outcomes.

The findings are consistent with data from two prior studies,^{19,20} however, lack of benefit reported with partner PMTCT engagement in Malawi is in conflict with the outcomes found in this research.²¹ Further studies may be needed to validate the findings in diverse geographic and cultural settings. Given the current preponderance of observational evidence,

interventional studies are needed to more rigorously evaluate the impact of male involvement in infant health outcomes. In future trials it would likely be beneficial to randomize participants to comparative forms of male involvement as this would facilitate partner participation in family oriented healthcare delivery and aid in exploring the impact of varying forms of male engagement.³⁷

The observation of improved infant survival with male involvement concur with the larger body of data supporting the beneficial association between male ANC participation and PMTCT service utilization by women living with HIV.^{9,12-14} In this study however there were no differences in PMTCT utilization between women with and without male engagement. Neither ARV utilization nor EBF adherence differed significantly between groups. The mechanism of improved survival among infants with male ANC attendance is unclear. It may reflect male partners who subsequently are more involved with infant care and provide access to medical services when needed. Male ANC attendance was associated with factors potentially indicative of greater partnership commitment and communication. Specifically, women in monogamous relationships and those reporting that their male partners had disclosed being previously tested for HIV had a greater likelihood of male ANC engagement. Thus, infant survival benefits may stem from more supportive male-female partnerships. As the reported data did not allow for delineation of these potential mechanisms, further research, likely utilizing mixed methods, to identify and explore these beneficial partnership characteristics is needed.

The overall prevalence of vertical transmission in the studied population was 2.4%, which is lower than the reported prevalence in Kenya. This is may be due to high PMTCT uptake in the cohort: rates of both ARV use and EBF practices were above national averages during the study period.⁵ Although the prevalence and incidence of vertical transmission was greater among infants born to women without partner ANC attendance, the reduced risk of HIV infection was not statistically significant. This likely represents insufficient power to assess the outcome due to the low number of infections. Subsequently, when considering the composite outcome of HIV-free survival the predominant component was mortality. This factor is congruent with the hypothesis of aspects of partnership support being the etiological drivers of the observed survival benefit rather than enhancement of specific aspects of PMTCT which would be expected to impact more greatly on the vertical transmission outcome. This postulate however cannot be assessed from the results presented and further data evaluating these potential mechanisms are needed.

In this study, the likelihood of male ANC engagement was enhanced with previous exposure to HIV testing services. This is consistent with earlier work from similar settings showing increased ANC attendance with prior HIV testing and serostatus awareness among male partners.^{19,22} These findings support the public health impetus to improve coverage of HIV testing, especially in settings with high HIV prevalence and infant mortality. Consistent with previous studies from Africa, overall male ANC engagement was low in this cohort.^{16,19,22-24} Considering the persistent sub-optimal levels of participation in concert with recognition that HIV testing improves attendance, exploration of novel male testing and engagement strategies is needed. A trial from western Kenya that randomized women attending the ANC to home visits versus written invitations for their male partners found

significantly increased uptake in male HIV testing with home visits at 85% as compared to 36% in the clinic-based invitation arm.³⁰ Research exploring novel methods such as home-based testing and education to engage men during pregnancy and post-partum will continue to be important given the benefits observed.

This study has limitations. The design was not randomized which may have resulted in selection bias and this could reduce the generalizability of the findings. For women lacking male ANC involvement only a subset of men were sampled, and characteristics of this subset were used in analyses for correlates of male ANC attendance. Among men who failed to attend antenatally, differences between those who completed postnatal data collection and those who did not were assessed based on female partner data and only male employment status was found to be significantly different between the subgroups (Supplemental appendix). Given the homogeneity of the non-attending group it is likely that the subset sampled is representative of that larger population of non-engaged partners, however there may have existed unmeasured confounders and this limitation must be considered.

Infant follow-up was only carried out through six weeks postpartum which could restrict the application of these results to longer survival times. Although the majority of vertical HIV transmission events occur peripartum, later transmission accounts for a substantial proportion of infant HIV infections.³⁸⁻⁴⁰ However, in consideration of the prior infant health benefits documented in a similar population through one year postpartum the proportional survival advantage with male involvement would likely have been maintained with longer follow-up.¹⁹ The pragmatic design of this study utilized national standard PCR testing to diagnose vertical transmission events.³⁴ Although PCR is a highly accurate diagnostic assay, the lack of serial testing may have resulted in imperfect sensitivity and imprecise timing of infant infection.⁴¹ Additionally, mortality event time was partially based on maternal report, which may have suffered from recall bias. Either of these factors could have resulted in misclassification of outcomes. If this did occur the error would be non-differential and bias towards the null, and any beneficial relationship between male ANC attendance and improved HIV-free survival would be an underestimation of the strength of the association.

Finally, data from this work did not directly evaluate participants' perceived barriers to male partner ANC attendance, and this is a limitation. Although there is literature showing that both males and female partners in many sub-Saharan African contexts are not averse to male participation in antenatal settings, sociocultural and systems barriers persist and impede achievement of recommended levels of engagement.⁴²⁻⁴⁴ Thus, research addressing barriers in conjunction with studies assessing novel mechanisms to engage the male partner population in sub-Saharan Africa would be informative to the knowledge base.

Conclusions

This prospective cohort study demonstrated an association between male ANC attendance and improved infant HIV-free-survival through six weeks of life. In light of these findings further interventional trials are warranted to more robustly assess the role of male ANC involvement in relation to infant outcomes. Additionally, male attendance was more likely among men exposed to prior HIV testing and research evaluating novel mechanisms to

achieve higher male HIV testing and improve engagement are needed. Although international guidelines call for male participation in ANC/PMTCT services, achieving consistent male engagement has been difficult in high burden regions. Considering the findings from this study, the low levels of male involvement may preclude attainment of virtual elimination of vertical transmission goals and inhibit improving overall infant survival.^{10,45}

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.
Study Population

Figure 2. Kaplan-Meier plots of infant six week mortality and HIV-free survival

Figure 2A. Mortality by male partner antenatal clinic attendance: dashed line (–) infants of women with male attendance and solid line (–) infants of women without male attendance. Log-rank $p=0.049$

Figure 2B. HIV-free survival by male partner antenatal clinic attendance: dashed line (–) infants of women with male attendance and solid line (–) infants of women without male attendance. Log-rank $p=0.0135$

Table 1**Male Partner Characteristics by ANC Attendance**

Characteristics	Attended ANC (n=136)	Failed to Attend ANC (n=63)	P
Age (years)	33.9(±7.0)	33.9(±5.9)	0.999
Relationship type			
monogamous	129(94.9%)	50(79.4%)	0.001
polygamous/girlfriend	7(5.1%)	13(20.6%)	
Education			
primary schooling	55(40.4%)	29(46.8%)	0.403
secondary schooling	81(59.6%)	33(53.2%)	
Sexual relations with other partners			
no	116(85.9%)	45(77.6%)	0.153
yes	19(14.1%)	13(22.4%)	
Employment			
salaried	50(36.8%)	14(22.6%)	0.174
self-employed	35(25.7%)	17(27.4%)	
laborer	43(31.6%)	24(38.7%)	
unemployed	8(5.9%)	7(11.3%)	
Previous children together			
no	61(46.9%)	22(37.9%)	0.251
yes	69(53.1%)	36(62.1%)	
Previous HIV testing			
no	13(9.6%)	17(26.0%)	0.002
yes	122(90.4%)	46(73.0%)	
Previous HIV test result			
negative	54(44.6%)	16(34.0%)	0.212
positive	67(55.4%)	31(66.0%)	
Type of previous HIV testing			
Individual VCT	41(34.2%)	25(52.1%)	0.032
Couples VCT	79(65.8%)	23(47.9%)	
Informed partner of previous HIV test results			
no	53(39.0%)	31(49.2%)	0.174
yes	83(61.0%)	32(50.8%)	
Report of female serostatus			
negative	5(3.8%)	4(6.7%)	0.001
positive	128(96.2%)	50(83.3%)	
uncertain	0(0.0%)	10(6.0%)	
Aware that MTCT is possible			
no	4(3.3%)	8(14.0%)	0.008
yes	117(96.7%)	49(86%)	
Discussed PMTCT with partner			

Characteristics	Attended ANC (n=136)	Failed to Attend ANC (n=63)	P
no	26(20.3%)	21(38.9%)	0.009
yes	102(79.7%)	33(61.1%)	

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Table 2

Maternal and Child Characteristics by Male ANC Attendance

Characteristics	Male Attended ANC (n=136)	Male Did Not Attend ANC (n=383)	P
Clinic site			
Kangemi	17(12.5%)	73(19.0%)	0.120
Riruta	29(21.3%)	51(13.3%)	
Dandora	29(21.3%)	65(17.0%)	
Baba Dogo	23(16.9%)	70(18.3%)	
Kayole	20(14.7%)	59(15.4%)	
Mathare North	18(13.2%)	65(17.0%)	
Maternal Age (years)	27.2(±5.2)	27.2(±4.9)	0.927
Maternal education level			
primary schooling	124(91.2%)	356(93.0%)	0.500
secondary schooling	12(8.8%)	27(7.1%)	
Gravida	2.1(±1.4)	1.9(±1.4)	0.398
Duration of relationship	6.2(±4.4)	5.8(±4.3)	0.527
Relationship type			
monogamous	128(94.1%)	327(86.5%)	0.017
polygamous/girlfriend	8(5.9%)	51(13.5%)	
Previous Male HIV test as per female report			
no	23(18.6%)	94(31.1%)	0.008
yes	101(81.5%)	208(68.9%)	
Male HIV test result per female report			
negative	44(43.6%)	79(38.4%)	0.381
positive	57(56.4%)	127(61.7%)	
Partner discussion of PMTCT as per female			
no	40(29.9%)	134(36.3%)	0.178
yes	94(70.1%)	235(63.7%)	
Maternal CD4 count (cells/μl) ^a	408.9 (291.4, 549.9)	471.4 (290.0, 651.9)	0.374
EBF ^b at six weeks post-partum			
not EBF	35(27.1%)	67(20.5%)	0.125
EBF	94(72.9%)	260(79.5%)	
Maternal ARV therapy ^c			
not on ARV therapy	71(52.2%)	217(57.7%)	0.267
on ARV therapy	65(47.8%)	159(42.3%)	
Infant PMTCT ARV therapy ^d			
no	24(17.7%)	74(19.7%)	0.605
yes	112(82.3%)	302(80.3%)	
Infant HIV infection by six weeks post-partum			
negative	131(99.2%)	356(97.0%)	0.197

Characteristics	Male Attended ANC (n=136)	Male Did Not Attend ANC (n=383)	P
positive	1(0.8%)	11(3.0%)	
Infant death by six weeks post-partum			
alive	129(98.5%)	346(94.3%)	0.053
deceased	2(1.5%)	21(5.7%)	
Infant HIV-free survival by six weeks post-partum			
survivor	129(97.7%)	335(91.3%)	0.010
non-survivor	3(2.3%)	32(8.7%)	

^aReported as median value with IQR

^bEBF = exclusive breastfeeding

^cMaternal ARV regimes ((AZT/3TC/NVP 80%, D4T/3TC/NVP 17%, other 3%)

^dInfant PMTCT ARV regimes (NVP 11%, AZT 14%, AZT+NVP 75%)

Table 3**Male ANC Attendance and Infant Health Outcomes**

	Incidence/100 person-years (95%CI)	HR (95% CI)	p value	aHR (95%CI)	p value
HIV infection					
Male ANC attendance	6.7 (0.9-47.7)	-		-	
No male ANC attendance	28.0 (15.5-50.6)	-		-	
Infant mortality					
Male ANC attendance	13.4 (3.4-53.8)	-		-	
No male ANC attendance	53.5 (34.9-82.1)	3.83 (0.90-16.33)	0.070	3.72 (0.87-15.94)	0.077
HIV-free survival					
Male ANC attendance	20.2 (6.5-62.6)	-		-	
No male ANC attendance	81.5 (57.6-115.3)	3.95 (1.21-12.89)	0.023	3.79 (1.15-12.43)	0.028