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Partner Notification and Treatment for Sexually Transmitted
Infections among Pregnant Women in Cape Town, South Africa

A thesis submitted in partial satisfaction
of the requirements for the degree Master of Science
in Epidemiology

by

Hunter Robinson Green

2020

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ABSTRACT OF THE THESIS

Partner Notification and Treatment for Sexually Transmitted
Infections among Pregnant Women in Cape Town, South Africa

by

Hunter Robinson Green

Master of Science in Epidemiology

University of California, Los Angeles, 2020

Professor Anne W. Rimoin, Chair

Background: Curable sexually transmitted infections (STIs) including *Chlamydia trachomatis* (CT), *Neisseria gonorrhoeae* (NG), and *Trichomonas vaginalis* (TV) are associated with adverse pregnancy outcomes. Partner notification is an important component of STI control as it has been shown to prevent re-infection and reduce infectious burden. However, few studies have examined partner notification among pregnant women in sub-Saharan Africa.

Methods: Between October 2017 and February 2019, we conducted a cohort study of women ≥ 18 years attending antenatal care in Cape Town, South Africa. Prior to STI screening, participants were asked if they would notify their partner if they were diagnosed with an STI. Women self-collected vulvovaginal swabs at first antenatal visit, during the third trimester and postpartum. Trained staff tested the swabs for CT, NG, and TV using Xpert® assays (Cepheid, USA). At the

following visit, STI-infected women were asked if they notified their partner and if their partner sought treatment and was treated. We used logistic regression to evaluate correlates of partner notification and partner notification and treatment.

Results: Among the 242 participants, 234 (97%) reported being willing to notify partners if they tested positive and 189 (78%) thought their partner would be willing to take medication to treat the STI. Of the 73 women who were diagnosed with an STI (30%) and reported having a sex partner, 68 (93%) reported notifying their partner, 47 (64%) reported their partner sought treatment, and 46 (63%) reported their partner took medication to treat the STI. Younger pregnant women (ages 18-31) had over three times the odds of partner notification and treatment (OR=3.82;95%CI=1.34-10.90) compared to older women.

Conclusions: Pregnant women were willing to notify their partners, leading to a high rate of notification. Nearly two-thirds of women who were diagnosed with an STI reported that their partner was treated. Younger maternal age was associated with partner notification and treatment. Future research on interventions to improve partner notification and treatment is needed.

The thesis of Hunter Robinson Green is approved.

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2020

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Introduction

Chlamydia trachomatis (CT), *Neisseria gonorrhoeae* (NG), and *Trichomonas vaginalis* (TV) are among the most common sexually transmitted infections (STIs) globally. According to the World Health Organization, 370 million new cases of these three curable STIs are estimated to occur each year among adults aged between 15 and 49 years.¹ In pregnancy, untreated STIs are associated with adverse outcomes including stillbirth, preterm labor and delivery, and low birth weight.²⁻⁴ Some curable STIs can also be vertically transmitted to the neonate during birth, causing conjunctivitis and pneumonia.⁵ In addition, STIs have been shown to increase the risk of Human Immunodeficiency Virus (HIV) acquisition and mother-to-child transmission, and the risk is highest in women with multiple STIs.^{6,7}

Partner notification is an important component of STI management and control because successful notification and treatment can prevent reinfection of the index patient and reduce the burden of these infections.⁵ Due to cost and time associated with partner expedited treatment, many low- and middle-income countries use a patient-led partner notification strategy where the index patient (patient diagnosed with an STI) informs their own partner and refers them to treatment.^{5,8} However, in a recent systematic review of studies conducted in sub-Saharan Africa, the proportion of index STI patients who notified their partner using this strategy was only 53% (range 23-95%).⁹ Of those who successfully notified their partner, 25% (range 0-77%) had partners that sought treatment.⁹ In another study at a community-based clinic in South Africa, participants reported notifying only 64% of partners of their STI diagnosis.¹⁰ Among South Africans, fears of intimate partner violence and relationship dissolution have been identified as barriers to partner notification following diagnosis with an STI.^{11,12} Others have been conducting research on how best to

optimize STI management, including partner notification, in South Africa since the late 1990s.¹³⁻

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Although the prevalence and incidence of curable STIs in pregnancy are high in sub-Saharan Africa, few studies in the region have examined the acceptability of partner notification in pregnant women.¹⁷⁻²⁰ In one study of HIV-infected pregnant women in Uganda, 58% of index patients with a positive test for syphilis agreed to notify their partner and 59% of notified partners returned to the clinic for treatment.¹⁹ Another study of pregnant women in Botswana found that while 98% of participants at baseline said they would be willing to notify their partner if they tested positive for CT, NG, or TV, only 84% reported actually doing so and 63% reported that their partner received STI treatment.²⁰ Our study sought to better understand partner notification in pregnant women following STI diagnosis to inform interventions and policy makers about how best to provide STI diagnostics and treatment in pregnancy. We evaluated the acceptability of partner notification for STIs among pregnant women and examined factors associated with both partner notification and successful partner notification and treatment in antenatal care in Cape Town, South Africa.

Methods

Between October 2017 and February 2019, we conducted a cohort study of pregnant women attending antenatal care at a public sector facility in Cape Town, South Africa. The setting, data collection, and specimen collection and testing have been previously described.¹⁷ Briefly, women ≥ 18 years and currently pregnant (< 34 -weeks) were eligible to participate in the study. Women participated in three visits throughout their pregnancy: at first antenatal visit, during the third trimester, and post-partum. At each study visit, trained staff administered surveys to collect self-reported information on participant demographics, sexual behavior during pregnancy, partner

history, history of intimate partner violence and recent STI symptoms. Participants were asked if they were diagnosed with an STI, would they notify their partner. They were also asked if they thought that their partner would be willing to take medication to treat the STI. Maternal HIV status was determined by rapid HIV antibody testing administered at each visit if the participant was HIV-negative at the previous visit.

Women self-collected vulvovaginal swab specimens each study visit, and trained staff tested the swabs for CT, NG, and TV using Xpert® assays (Cepheid, Sunnyvale, CA). Women with a positive STI result were treated in accordance with South Africa National Guidelines.²¹ CT infections were treated with 1 g azithromycin orally, NG with an intramuscular injection of 250 mg ceftriaxone plus 1 g azithromycin orally (2 g azithromycin if significant penicillin allergy), and TV with 400 mg metronidazole orally every twelve hours for seven days. In addition to receiving treatment, women were encouraged to notify their partner of their STI diagnosis and given a partner referral letter. The letter included the specific STI(s) that the participant was diagnosed with and treated for along with a recommendation to present to the clinic within seven days for treatment, as well as the work telephone number of the study nurse. At the following visit, participants were asked if: (1) they gave their partner the referral letter, (2) their partner went to a clinic or pharmacy for treatment, and (3) their partner took the medication to treat the STI. (Figure

1)

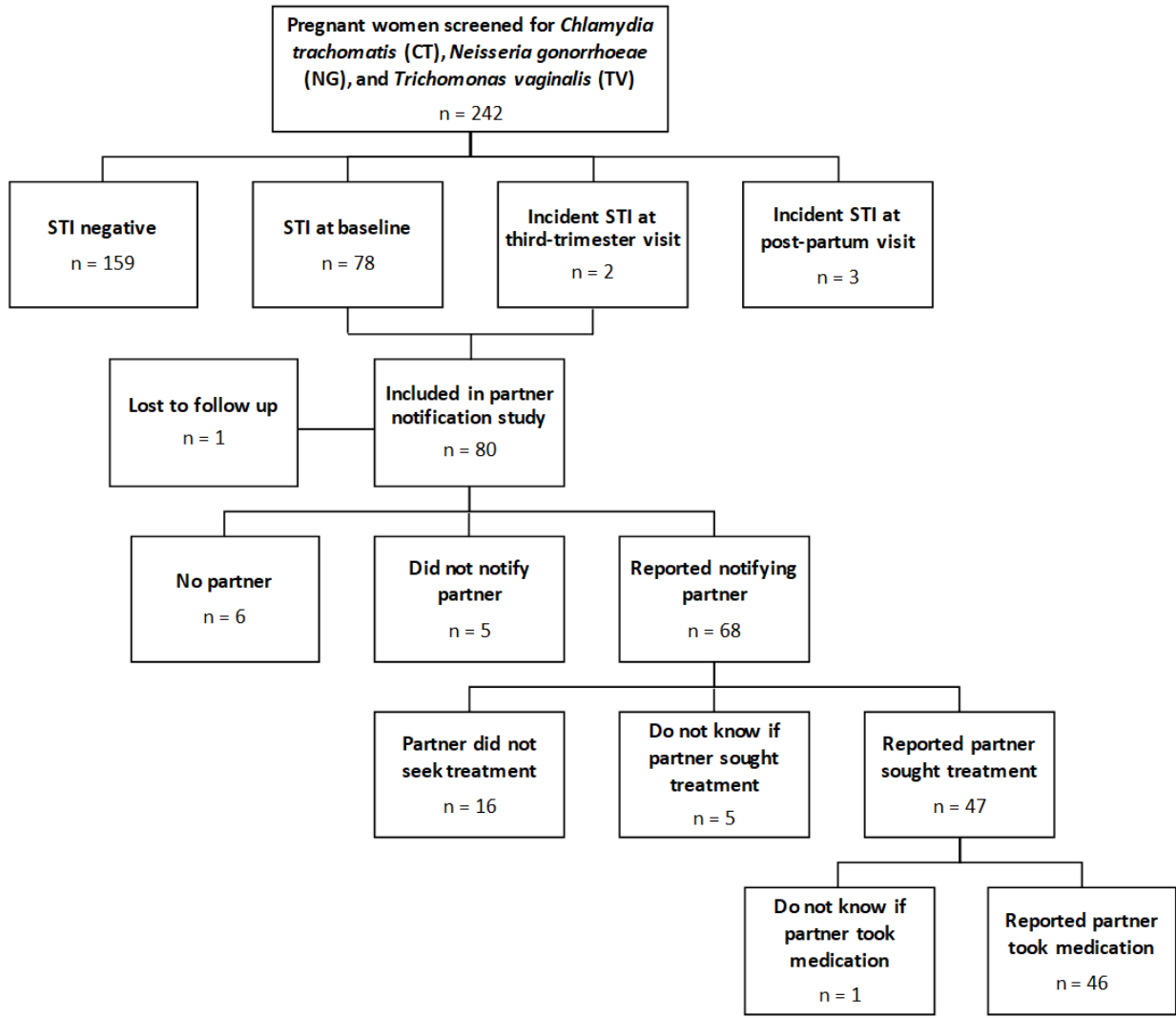


Figure 1. Partner notification and treatment for STIs among pregnant women, Cape Town, South Africa, 2017-2019 (n=242)

Statistical analysis

This is an analysis from a subset of a cohort study of STI prevalence and incidence in pregnant women.¹⁷ Categorical variables are reported as frequencies and percentages. Continuous variables are presented as medians and interquartile ranges (IQR). We used logistic regression to evaluate factors associated with partner notification. In addition, we evaluated factors associated

with partner notification and treatment. Statistical analyses were performed using SAS version 9.4 (SAS Institute, 2013).

Ethics

The Human Research Ethics Committee at the University of Cape Town Faculty of Health Sciences (#454/2017) and the Institutional Review Board at the University of California, Los Angeles (#19-000237) approved the study protocol. Informed consent was obtained from all participants before enrollment.

Results

We enrolled 242 pregnant women at first antenatal visit. The median age of participants was 29 years (IQR=24-34 years) and median gestational age was 19 weeks (IQR=13-24 weeks). More than half of participants reported being unmarried, not cohabiting with, or having no relationship with the father of their child (52%, n=127). Forty-four percent were HIV-infected at first antenatal visit (n=107) and 14% reported being in a concordant HIV-infected relationship (n=34), but 38% did not know their partner's HIV serostatus (n=89). The majority of participants reported vaginal sex during pregnancy (93%, n=225). One-third of women suspected their partner of having other sex partners (n=79). Few women reported intimate partner violence during pregnancy or in the 12 months prior to pregnancy (4%, n=9). Twenty-one percent reported having ever been diagnosed with an STI prior to the current pregnancy (n=52). Almost one-quarter of participants reported recently experiencing STI-related symptoms including abnormal vaginal discharge, increased pain during intercourse, pain during urination, vaginal bleeding and/or genital sores (24%, n=59). Nearly all women reported that they would notify their partner if they tested positive for an STI in this study (97%, n=234), and more than three-quarters (78%, n=189) thought their partner would be willing to take medication to treat the STI. (Table 1)

Table 1. Baseline demographic, clinical and behavioral characteristics of pregnant women attending first antenatal visit, Cape Town, South Africa, 2017-2019 (n=242)

	n	%
Demographic characteristics		
Maternal age, median (IQR)	29 (24-34)	
Gestational age in weeks, median (IQR)	19 (13-24)	
Relationship with father of child		
Married/cohabiting	115	48%
Unmarried/not cohabiting	120	50%
No relationship	7	3%
Experienced intimate partner violence	9	4%
Clinical characteristics		
Ever diagnosed with an STI in past	52	21%
STI diagnosis in study		
STI Negative	164	68%
STI Positive (any)	78	32%
CT	49	20%
NG	14	6%
TV	37	15%
Any STI symptoms		
No	183	76%
Yes	59	24%
HIV status		
HIV Negative	135	56%
HIV Positive	107	44%
Sexual behavior during pregnancy		
Vaginal sex	225	93%
Oral sex	10	4%
Anal sex	7	3%
2+ sex partners in past 3 months	3	1%
Suspect partner of having other sex partners	79	33%
Couple serostatus		
Concordant HIV negative	93	38%
Concordant HIV positive	34	14%
Discordant (female positive, male negative)	22	9%
Discordant (female negative, male positive)	4	2%
Don't know partner's status	89	37%
Willing to notify partner of STI results	234	97%
Participant reported partner willingness to take medication	189	78%

At first antenatal visit, 32% percent of participants were diagnosed with at least one STI (n=78). Of those women, 31 (40%) tested positive for CT, two (3%) for NG, 24 (31%) for TV, eight (10%) for CT and NG, nine (12%) for CT and TV, three (4%) for NG and TV, and one (1%) for all three STIs. In addition, two participants were diagnosed with an incident STI at the third trimester visit and three were diagnosed with an incident STI at the post-partum visit. Among women with an incident STI at the third trimester visit, one was infected with CT and one with TV. Of the women with an incident STI at the post-partum visit, all three were infected with CT.

Partner notification and treatment

Overall, 83 women were diagnosed with at least one STI during the study (34%). Partner notification information was not obtainable from the three participants (4%) that tested positive for an incident infection at the post-partum visit due to that being the final study visit. In addition, seven women (8%) were unable to provide answers to the notification-related questions because six did not have a partner during the study period and one was lost to follow-up.

Among the 73 participants who were diagnosed with an STI and had contactable partners, 68 (93%) reported notifying their partner and giving them the referral letter for treatment. Of the five participants (7%) who did not notify their partner, one reported that their partner was out of town, one reported that their partner had relocated to another province, one refused to take the referral letter from the nurse and two reported that their partners refused to take the referral letter, leading to dissolution of the relationship. In addition, three (60%) of these women were HIV-infected and two (40%) were HIV-uninfected. Partner notification uptake did not differ by STI diagnosed in the index patient. Among the 68 women who reported notifying their partner, 47 (69%) reported that their partner sought treatment for the STI and five (7%) did not know if their partner sought treatment. The most common barrier to a partner seeking treatment, as reported by

the partner, was refusal to attend a clinic or pharmacy (44%, n=7) followed by a conflicting work schedule (31%, n=5) and a perceived lack of illness due to an asymptomatic infection (6%, n=1). Three women (19%) did not provide reasons for not seeking treatment. Of the 47 participants who reported that their partner sought treatment, 46 (98%) reported that their partner took the medication to treat the STI and one (2%) did not know if their partner took the medication. Among the 46 women that reported their partner was treated, 12 women reported that their partner went to the same health facility as the index patient (26%), 12 reported getting treatment from a private pharmacy (26%), eight reported seeking treatment from another health facility (17%) and 14 women did not know where their partner was treated (30%).

Factors associated with partner notification

We analyzed results to evaluate factors associated with partner notification following STI diagnosis in pregnant women in antenatal care. Our study was underpowered to detect associations between participant characteristics and partner notification, but nearly all women reporting being married to or cohabiting with the father of their child (96%, n=27) or recently experiencing STI-related symptoms (96%, n=25) also reported notifying their partner. All women that reported recently experiencing intimate partner violence (n=5), being diagnosed with an STI prior to the current pregnancy (n=11) or being in a concordant HIV-negative relationship (n=23) also reported notifying their partner. (Table 2)

Table 2. Factors associated with partner notification for STIs among pregnant women, Cape Town, South Africa, 2017-2019 (n=73)

	Total		Partner notified		Partner not notified		OR (95% CI)
	n	%	n	%	n	%	
Total	73	100%	68	93%	5	7%	
Demographic characteristics							
Maternal age at baseline, median (IQR)	28 (24-33)		28 (24-33)		30 (27-30)		0.98 (0.84-1.15)
18 - 31	51	70%	47	92%	4	8%	0.56 (0.06-5.31)
32 - 41	22	30%	21	95%	1	5%	Reference
Relationship with father of child							
Married/cohabiting	28	38%	27	96%	1	4%	2.63 (0.28-24.85)
Unmarried/not cohabiting/no relationship with father of child	45	62%	41	91%	4	9%	Reference
Experienced intimate partner violence	5	7%	5	100%	0	0%	-
Clinical characteristics							
Ever diagnosed with an STI	11	15%	11	100%	0	0%	-
Any STI symptoms							
No	47	64%	43	91%	4	9%	Reference
Yes	26	36%	25	96%	1	4%	2.33 (0.25-21.98)
HIV status							
HIV Negative	34	47%	32	94%	2	6%	1.33 (0.21-8.49)
HIV Positive	39	53%	36	92%	3	8%	Reference
Sexual behavior during pregnancy							
Vaginal sex	68	93%	63	93%	5	7%	-
Oral sex	2	3%	2	100%	0	0%	-
Anal sex	1	1%	1	100%	0	0%	-
Suspect partner of having other sex partners (n=11 missing)							
No	32	52%	30	94%	2	6%	1.67 (0.26-10.74)
Yes	30	48%	27	90%	3	10%	Reference

Table 2. Factors associated with partner notification for STIs among pregnant women, Cape Town, South Africa, 2017-2019 (n=73)

	Total		Partner notified		Partner not notified		OR (95% CI)
Couple serostatus							
Concordant HIV negative	23	32%	23	100%	0	0%	-
Concordant HIV positive/discordant/don't know	50	68%	45	90%	5	10%	Reference

Factors associated with partner notification and treatment

Among women with contactable partners (n=73), 46 (63%) reported both that they notified their partner and their partner took medication to treat the STI, while 27 (37%) either reported that they did not notify their partner or their partner did not take medication to treat the STI. Younger pregnant women aged 18 to 31 years had over three times the odds of partner notification and treatment (OR=3.82; 95% CI=1.34-10.90) compared to those aged 32 and older. A larger proportion of HIV-negative (71%) than HIV-positive (56%) participants reported that they notified their partner and their partner was treated, but this was not associated with partner notification and treatment (OR=1.85; 95% CI=0.70-4.90). However, being in a concordant HIV-negative relationship was associated with partner notification and treatment (OR=2.83; 95% CI=0.91-8.82). (Table 3)

Table 3. Factors associated with partner notification and treatment for STIs among pregnant women, Cape Town, South Africa, 2017-2019 (n=73)

	Total		Partner notified and reported treatment		Partner not notified or not reported treatment		OR (95% CI)
	n	%	n	%	n	%	
Total	73	100%	46	63%	27	37%	
Demographic characteristics							
Maternal age at baseline (median, IQR)	28 (24-33)		28 (24-30)		30 (25-35)		0.93 (0.85-1.01)
18 - 31	51	70%	37	73%	14	27%	3.82 (1.34-10.90)
32 - 41	22	30%	9	41%	13	59%	Reference
Relationship with father of child							
Married/cohabiting	28	38%	19	68%	9	32%	1.41 (0.52-3.80)
Unmarried/not cohabiting/no relationship with father of child	45	62%	27	60%	18	40%	Reference
Experienced intimate partner violence	5	7%	4	80%	1	20%	2.48 (0.26-23.38)
Clinical characteristics							
Ever diagnosed with an STI	11	15%	5	45%	6	55%	0.43 (0.12-1.56)
Any STI symptoms							
No	47	64%	32	68%	15	32%	Reference
Yes	26	36%	14	54%	12	46%	0.55 (0.20-1.47)
HIV status							
HIV Negative	34	47%	24	71%	10	29%	1.85 (0.70-4.90)
HIV Positive	39	53%	22	56%	17	44%	Reference
Sexual behavior during pregnancy							
Vaginal sex	68	93%	43	63%	25	37%	1.15 (0.18-7.34)
Oral sex	2	3%	1	50%	1	50%	0.58 (0.04-9.63)
Anal sex	1	1%	0	0%	1	100%	-

Table 3. Factors associated with partner notification and treatment for STIs among pregnant women, Cape Town, South Africa, 2017-2019 (n=73)

	Total		Partner notified and reported treatment		Partner not notified or not reported treatment		OR (95% CI)
Suspect partner of having other sex partners (n=11 missing)							
No	32	52%	22	69%	10	31%	2.20 (0.78-6.19)
Yes	30	48%	15	50%	15	50%	Reference
Couple serostatus							
Concordant HIV negative	23	32%	18	78%	5	22%	2.83 (0.91-8.82)
Concordant HIV positive/discordant/don't know	50	68%	28	56%	22	44%	Reference

Discussion

Our study assessed the acceptability of partner notification for STIs among pregnant women in antenatal care at a public clinic in Cape Town, South Africa. We found that almost all women reported that they would notify their partner if they tested positive for an STI and of those who were diagnosed, the vast majority did report notifying their partner. However, while more than three-quarters of participants thought their partner would be willing to take medication to treat the STI, just under two-thirds reported that their partner was treated. Our study was underpowered to detect associations between participant characteristics and partner notification, but all women that reported intimate partner violence, being previously diagnosed with an STI or being in a concordant HIV-negative relationship reported notifying their partner. Younger women had increased odds of partner notification and treatment. In addition, being in a concordant HIV-negative relationship was associated with partner notification and treatment.

Similar to a study conducted among pregnant women in Botswana by Offorjebe et al, we found that nearly all participants were willing to notify their partner of an STI diagnosis and just under two-thirds reported that their partner was treated presumptively.²⁰ However, the proportion of women who reported notifying their partner was higher than that reported in Botswana and among the highest identified by a systematic review of partner notification in sub-Saharan Africa.^{9,20} In addition, the proportion of those reporting partner notification was higher than that previously reported among male and female index patients in Cape Town.¹⁰

In our study, barriers to partner notification included relationship dissolution and partners being out of town, a finding consistent with previous studies conducted in both South Africa and other countries in sub-Saharan Africa.^{9,12,22} Interestingly, while fear of intimate partner violence is a commonly cited barrier, all women that reported recently experiencing intimate partner violence

also reported notifying their partner.¹¹ The most common obstacles to partners being treated were a refusal to visit a clinic or pharmacy and a conflicting work schedule, well-documented barriers to males seeking treatment for both STIs and HIV.^{23,24} One partner notification strategy that may help address these barriers is expedited partner therapy where the index patient is provided with medication to deliver to their partner, allowing the partner to get treated without visiting a clinic.¹³ However, there are potential disadvantages to expedited partner therapy including adverse drug reactions and the inability to screen partners for other STIs and HIV.²⁵

Prior studies have found that having only one partner, having had a long-term relationship with the partner and considering the partner to be their main partner are predictors of successful partner notification.^{26,27} Younger pregnant women (ages 18-31) had over three times the odds of partner notification and treatment compared to older women. However, a study conducted in Louisiana, USA by Kissinger et al found that women who reported their partner was treated were more likely to be older.²⁸ Additional studies have found that having only partner, considering that partner to be their main partner and living with the partner are associated with successful partner notification and treatment.^{28,29}

Our study did have some limitations. First, the study had a small sample size which decreased our precision and limited our ability to identify relationships between participant characteristics and partner notification. Second, our study utilized self-reported responses to collect data on intimate partner violence, sexual behavior and partner notification and treatment. Thus, intimate partner violence and sexual behavior may be under-reported while partner notification and treatment may be over-reported due to recall bias. Next, the generalizability of our study may be limited because we collected data from one facility. However, we attempted to select a clinic that was representative of others in the region regarding patient socio-demographics (race,

gender and income) and services offered. Finally, this was an analysis of a cohort study that evaluated the prevalence, incidence and correlates of STIs in pregnant women. As a result, we did not collect data on male partner characteristics, information that would likely be helpful in identifying factors associated with male partner treatment.

Our results suggest that pregnant women are willing to notify their partners, leading to a high rate of notification. However, over one-third of partners did not get treated for STIs during the study period. Future studies on different partner notification strategies with larger sample sizes, multiple locations and data on male partner characteristics are necessary to understand facilitators of and barriers to successful partner notification and treatment and decrease adverse outcomes associated with untreated STIs in pregnant women.

Conclusion

We found a high rate of partner notification for curable STIs among pregnant women attending antenatal care, yet over one-third of women diagnosed with an STI reported that their partner did not receive treatment. Younger maternal age was associated with successful partner notification and treatment. Future studies on interventions to improve partner notification and treatment are necessary to increase the proportion of partner treatment and decrease adverse outcomes associated with untreated STIs in pregnancy.

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