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Intimate Partner Violence Functions as both a Risk Marker and Risk Factor for Women's HIV Infection: Findings from Indian Husband-Wife Dyads

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Abstract

Context and Objective—Female victims of intimate partner violence (IPV) consistently demonstrate elevated STI/HIV prevalence. IPV is thought to function indirectly as a marker of abusive men's elevated STI/HIV infection and/or directly via facilitating transmission to wives. The present examination utilizes a nationally representative sample of married Indian couples to test these mechanisms and determine whether 1) abusive husbands demonstrate higher HIV infection prevalence compared with non-abusive husbands, and 2) the risk of wives' HIV infection based on husbands' HIV infection varies as a function of their exposure to IPV.

Design, Setting and Participants—The Indian National Family Health Survey-3 (NFHS-3) was conducted across all Indian states in 2005-2006. Analyses were limited to 20,425 husband-wife dyads which provided both IPV data and HIV test results.

Analyses—Logistic regression models estimated the odds ratios and 95% confidence intervals to evaluate the following associations: 1) husband's HIV acquisition outside the marital relationship based on their perpetration of IPV and 2) wives' HIV infection based on husbands' HIV infection, as a function of their IPV exposure.

Results—One-third (37.4%) of wives experienced IPV; 0.4% of husbands and 0.2% of wives were HIV infected. Compared with non-abusive husbands, abusive husbands demonstrated increased odds of HIV acquisition outside the marital relationship in adjusted models (AOR=1.91; 95% CI 1.11, 3.27). Husband HIV infection was associated with increased HIV risk among wives; this risk was elevated sevenfold in abusive relationships in adjusted models (AOR =7.22; 95% CI 1.05, 49.88).

Conclusions—Findings provide the first empirical evidence that abused wives face increased HIV risk based *both* on the greater likelihood of HIV infection among abusive husbands, as well as elevated HIV transmission within abusive relationships. Thus, IPV appears to function both as a risk marker and as a risk factor for HIV among women, indicating the need for interwoven efforts to prevent both men's sexual risk and IPV perpetration.

Background

The global HIV epidemic is rapidly “feminizing”.^{1, 2} Increasing numbers of women are HIV infected worldwide,¹ and within the Indian context women account for an estimated 40% of cases among 2.5 million people living with HIV/AIDS³. Limited pre-marital and extra-marital sexual behavior among Indian women^{4, 5} renders heterosexual transmission from husbands the dominant infection pathway for wives.⁵⁻⁷ High levels of intimate partner violence (IPV) victimization are consistently documented in South Asia,⁸⁻¹² with an estimated 1 in 3 women victimized across their lifetime.⁴ Such victimization is increasingly considered relevant to women's STI/HIV risk in this region¹²⁻¹⁴ and elsewhere.^{15, 16} A growing body of evidence demonstrates elevated STI/HIV prevalence among abused women,¹⁷⁻²¹ including recent findings from a national sample of Indian women illustrating greater HIV infection prevalence based on exposure to abuse from husbands.²² These data have prompted international attention to the possible mechanisms by which IPV and STI/HIV may relate,²³ however these theories remain untested to date.

Prior research highlights elevated sexual risk behaviors and STI prevalence among abusive men,^{12, 13, 16, 24, 25} bolstering the hypothesis that abusive men are more likely than nonabusive individuals to contract STI/HIV and may subsequently transmit infection to female partners. Thus, abused women's increased STI/HIV prevalence may reflect greater likelihood of STI/HIV exposure, rendering IPV a risk marker for their male partners' STI/HIV infection. IPV may also increase women's STI/HIV risk more directly by providing enhanced opportunity for STI/HIV transmission. Potential mechanisms by which abuse may facilitate STI/HIV transmission include women's limited negotiation capacity to refuse sex or use condoms,²⁶⁻²⁸ and the potential for physical trauma (i.e., tearing or lacerations) in situations of forced sex.²⁹ While IPV cannot lead to STI/HIV in the absence of pathogen exposure, abuse may serve to enhance transmission in the presence of male partner STI/HIV,²¹ rendering IPV a direct transmission risk factor. If determined to both a marker of abusive male partners' elevated STI/HIV infection prevalence and to mechanistically enhance STI/HIV transmission, IPV may be considered to pose “double jeopardy” to women, i.e., limited control over sexual relationships with male partners more likely to be HIV-infected.

To date, little work has begun to disentangle these two distinct vulnerabilities. Understanding the mechanisms underpinning abused women's elevated STI/HIV, i.e., whether IPV functions as a marker of abusive men's HIV risk and/or facilitates transmission, is critical for designing effective HIV prevention interventions. The India National Family Health Survey 3 (NFHS-3) represents the first national, population-based data on HIV status, sexual risk and IPV for husband-wife dyads. The data thus offer empirical strength in HIV assessment while maximizing inferences to the general population. The present analysis seeks to extend prior findings from these data indicating elevated HIV infection prevalence among abused women²² by estimating 1) the association of IPV with husbands HIV acquisition outside the marital relationship (i.e., IPV as a risk marker for an HIV-infected husband), and 2) the extent to which IPV may modify the risk to the wives from HIV-infected husbands (i.e., IPV as an HIV transmission mechanism or risk factor).

Methods

Design, Setting and Sample

The national, population-based India National Family Health Survey-3 (NFHS-3) was conducted in all 29 states of India by the International Institute for Population Sciences (IIPS) and Macro International from November 2005 to August 2006. The NFHS is referred to as the 'Demographic Health Survey' or 'DHS' in other national contexts, and is conducted regularly in many countries to obtain population-based estimates of major health threats. The NFHS involves confidential questionnaires administered verbally to male and female participants separately; surveys were bilingual within each state, i.e., each question was available in English and the principal language of the state. The nationally representative household-based sample for the NFHS-3 was created via a stratified, multistage cluster strategy. Within each state, two-stage (rural areas) and three-stage (urban areas) procedures identified 3,850 primary sampling units (PSUs) comprised of one or more villages in rural areas, and census enumeration blocks within wards in urban areas; PSU selection probability was proportional to size. Within each PSU, household enumeration generated the sampling frame for systematic selection of households. Trained research assistants conducted household-based recruitment and obtained written informed consent immediately prior to survey data collection. These procedures identified 131,596 eligible women ages 15-49, of which 124,385 completed the survey (response rate 95%; 124,385/131,596), and 85,373 eligible men ages 15-54 of which 74,369 completed the survey (response rate 87.1%; 74,369/85,373).⁴ The study protocol did not explicitly sample husband-wife dyads, rather, male participants' responses were matched to those of their married female partners to create a sample of husband-wife dyads (n=39,257) subsequent to data collection. Further details concerning the NFHS-3 procedures are available elsewhere.⁴

The analytic sample was limited to husband-wife dyads for whom both HIV testing and IPV survey data were available; separate procedures selected subsets of participants for these two components. HIV testing was conducted for a systematically selected subset of participants. The 3% (3,896/124,385) of female participants and 5% (3,971/74,369) of male participants from the state of Nagaland were not included in HIV testing due to local opposition. Of the remaining female participants, 49% (58,202/120,489) were selected for HIV testing of whom 91% (52,853/58,202) participated. Of the remaining male participants, 79% (55,311/70,398) were selected for HIV testing of whom 91% (50,093/55,311) participated. Among the matched husband-wife dyads, 67% (26,230/39,257) contained HIV test results for both husband and wife.

The analytic sample was further restricted to dyads in which the wife was systematically selected to complete the IPV assessment. Of 26,230 husband-wife dyads linked with HIV data, 78% (20,433/26,230) had IPV data and thus were included in the sample. The final sample size was 20,425 husband-wife dyads, following exclusion of 8 dyads based on incomplete exposure (IPV) data or reportedly never having had sexual intercourse.

Measures

Demographics including age, religion, and education were assessed via single self-reported items on both the men's and women's surveys. A relative index of household wealth was calculated based on interviewer-observed assets (e.g., ownership of consumer items); the resulting score was divided into quintiles. Self-reported lifetime number of sexual partners, lifetime history of condom use for contraceptive purposes (reported on both men and women's survey), and male circumcision (obtained via men's survey) were considered as sexual risk covariates.

The primary exposure, IPV, was assessed via self-report in accordance with World Health Organization (WHO) recommendations³⁰ and based on the Conflict Tactics Scale.³¹ Lifetime IPV victimization was indicated by a positive answer to any of the following 8 items pertaining to experiences at the hands of their current husband: “push you, shake you, or throw something at you”, “slap you”, “punch you with a fist or something harmful”, “kick, drag or beat you up”, “try to choke or burn you on purpose”, “threaten or attack you with a knife, gun, or any other weapon”, “physically force you to have sexual intercourse with him even when you did not want to” or “force you to perform any sexual acts that you did not want to”. The assessment was administered only when privacy could be ensured. Items demonstrated adequate internal consistency reliability with Cronbach’s alpha =0.76 for the current sample. Wives’ reports of victimization served as a proxy for husbands’ IPV perpetration in analyses pertaining to husbands.

HIV infection was assessed via collection and testing of dried blood spots (DBS) pending a separate written informed consent. HIV test results were linked to participant survey data via unique barcodes thus eliminating the need for individual identifiers and preserving anonymity of test results. Consistent with WHO/UNAIDS guidelines for population-based HIV seroprevalence assessment,³² a sequential multiple testing protocol was followed whereby all positive results and 5% of negative results diagnosed via the first ELISA (Microlisa by J. Mitra) were tested with a second ELISA (Enzaidd-Span 3 by Span Diagnostics); the Innolia Western Blot kit was used for non-matching results. The SRL Ranbaxy laboratory provided HIV antibody testing and compilation of results. An external quality control lab at the National AIDS Control Organization (NACO) in Pune, India validated a subsample of test results. All study procedures were approved by the ORC MACRO Institutional Review Board; the Harvard School of Public Health Human Subjects Committee deemed analyses exempt given the anonymous nature of the data.

Analysis

Prevalence estimates of IPV perpetration/victimization based on wives’ reports of husband behavior and husband and wife HIV infection were calculated. Differences in IPV and HIV based on demographics and sexual risk behavior were assessed separately for husbands and wives via Wald chi-square analyses; significance for all analyses was set at $p < 0.05$.

Assessment of the extent to which IPV represents a marker for husband’s HIV infection was conducted via logistic regression models which estimated odds ratios (ORs) and 95% confidence intervals (CIs) for the association of IPV perpetration with husband’s HIV infection. To maximize clarity and empirical strength in assessing the extent to which IPV perpetration related to husband’s acquisition of HIV infection outside the marital relationship, this analysis was restricted to husbands whose wives were not infected with HIV, i.e., those husbands who could not have acquired HIV via their wives ($n=20,358$). The model was subsequently adjusted for husbands’ sexual risk covariates (i.e., lifetime sex partners, lifetime condom use, circumcision) as well as husbands’ potential demographic confounders (i.e., age, education, household wealth). Religion was not included as a covariate given its collinearity with circumcision. OR and AOR estimates generated via logistic regression were evaluated for statistical significance based on 95% CIs not crossing 1.0.

Assessment of the extent to which HIV infection among wives related to husband HIV infection, and whether this effect varied based on the presence of IPV (i.e., IPV as a transmission risk factor), was conducted via logistic regression models which first estimated AORs and 95% CIs for associations of husband HIV infection with wives’ HIV infection using the full analytic sample. Covariates included wives’ sexual risk behaviors (i.e., lifetime number of sexual partners, lifetime condom use) and wives’ potential demographic

confounders (i.e., age, education, women's religion, and household wealth). The adjusted model was then stratified by presence of IPV in the marital relationship, i.e., IPV present (n=7,147) and IPV not present (n=13,278). The final model utilized the full analytic sample and included an indicator term reflecting exposure to both IPV and male partner HIV, while controlling for IPV. AOR estimates generated were evaluated for statistical significance based on 95% CIs not crossing 1.0. To maximize statistical power, missing data were imputed as the referent as follows for all multivariate analyses: missing education data were coded as having no education (8 husbands, 1 wife), missing condom use data were coded as having never used condoms (24 husbands, 30 wives), missing information on number of lifetime sex partners were coded as having had 1 partner (48 husbands, 40 wives), and 158 husbands with unknown circumcision status were classified as uncircumcised. Sensitivity analyses indicated that no effect estimate was modified by 1% or more based on these procedures. All analyses were conducted in STATA to accommodate the complex design of the NFHS-3; the 'svyset' command was used to accommodate potential non-independence of responses within PSUs and all analyses were weighted for non-response using the nationally representative men's and women's HIV testing weights standardized to the analytic sample.

Results

Prevalence and Correlates of IPV and HIV Infection among Husbands

The prevalence of IPV against wives among married Indian couples was 37.4% (95% CI 36.1, 38.7), and 0.4% (95% CI 0.3, 0.5) of husbands were HIV infected (Table 1). IPV perpetration prevalence inversely related to educational attainment ($p<0.001$) and household wealth ($p<0.001$), and varied across husbands' religious groupings with Muslim men demonstrating the highest prevalence (40.9%, $p<0.001$). Fewer than 1 in 5 husbands (18.3%) reported more than one sexual partner in their lifetime. IPV perpetration was more prevalent among such husbands (42.8% vs. 36.1%, $p<0.001$), and among those never having used condoms (40.0% vs. 30.6%, $p<0.001$). Husbands with more than one lifetime sex partner also demonstrated elevated HIV prevalence (0.7% vs. 0.3%, $p=0.013$).

Prevalence of HIV Infection and correlates of IPV victimization and HIV among Wives

Among wives, IPV victimization prevalence inversely related to educational attainment ($p<0.001$) and household wealth ($p<0.001$; Table 2). Muslim wives demonstrated the highest victimization prevalence relative to other religious groupings (41.0%, $p<0.001$). IPV victimization was more prevalent among wives having had multiple sex partners (54.8% vs. 37.2%, $p<0.001$) and those who had never used condoms (38.3% vs. 33.1%, $p<0.001$). The prevalence of HIV among wives was 0.2% (95% CI 0.1, 0.3); HIV infection varied by religious groupings and was most prevalent among Hindu wives (0.2%, $p=0.028$).

Associations of IPV Perpetration with Husband's HIV Infection Acquired Outside Marital Relationship

Among husbands whose wives were not HIV infected (i.e., husbands who were not at risk for HIV acquisition from their wives, n=20,358), the odds of HIV infection were significantly elevated based on IPV perpetration (OR 1.94; 95% CI 1.02, 3.69, Table 3). The association of IPV perpetration with husbands HIV infection persisted after controlling for husbands' demographic factors and sexual risk covariates (AOR 1.91; 95% CI 1.11, 3.27).

Associations of Husband HIV and Wives' HIV Infection, as a Function of IPV

Among all couples, husbands' HIV infection was associated with their wives' HIV infection after accounting for wives' demographics and sexual risk covariates (AOR 740.40; 95% CI

308.08, 1777.42, $p < 0.001$; Table 4). In analyses stratified by presence of IPV in the relationship, husband HIV infection related to wife HIV infection within both abusive (AOR 4610.88; 95% CI 858.96, 24751.04, $p < 0.001$) and non-abusive (AOR 544.97; 95% CI 198.38, 1497.09, $p < 0.001$) strata. In the final model, a multiplicative interaction term quantified the magnitude of the difference in these effect estimates. In the presence of an interaction term representing exposure to both husband HIV infection and IPV, the main effects for each component of the interaction term are interpreted as the odds of wives' HIV in the *referent* group for each component of the interaction term, i.e., the main effect of husband HIV infection (AOR 539.13; 95% CI 198.19, 1466.58, $p < 0.001$) is interpreted as the effect of husband HIV infection *in the absence* of IPV. A significant multiplicative interactive effect of exposure to both husband HIV and IPV on wives' HIV was detected, whereby the odds of wives' HIV infection based on husbands' HIV infection increased seven-fold in the presence of IPV (AOR 7.22; 95% CI 1.05, 49.88, $p = 0.045$) over the odds of wives' HIV infection based on exposure to husband HIV in the absence of IPV. No associations were detected between wives' sexual risk behaviors and their HIV infection status.

Discussion

Our findings from this first population-based investigation of the effect of IPV on HIV among husband-wife dyads indicate that abusive husbands increase their wives' HIV risk in the Indian context via two distinct, yet convergent, pathways, specifically abusive husbands' heightened risk of HIV infection and heightened risk of infection transmission in the presence of IPV. Compared with non-abusive husbands, abusive husbands demonstrated almost twice the odds of acquiring HIV outside their marital relationship. This finding supports concerns that abusive men are more likely to acquire HIV and subsequently introduce infection into their marital relationships; thus, IPV may be considered a *risk marker* for wives' HIV infection via abusive husband's greater odds of HIV infection. Moreover, compared to wives' exposure to their husbands' HIV infection in the absence of violence, wives' exposure to both IPV and husbands' HIV heightened their odds of contracting HIV sevenfold. This evidence supports the hypothesis that IPV may facilitate HIV transmission from an infected partner, rendering IPV a risk factor (i.e., direct mechanism) for women's HIV infection. Taken together, these results support the hypothesis that abused women's elevated HIV prevalence reflects their being subject to "double jeopardy", i.e., abused women are more likely to have an HIV-infected male partner, with whom HIV transmission may be enhanced based on abuse in the relationship.

These findings advance previous efforts devoted to understanding both elements of abused women's double jeopardy for HIV infection, with prior work informing the mechanisms likely responsible. Current evidence that abusive men are more likely to acquire HIV outside of the marital relationship (i.e., IPV as a risk marker for HIV) advances prior investigations across diverse settings demonstrating elevated sexual risk behavior and self-reported STI among abusive men^{12, 13, 16, 24} by confirming these findings via utilization of laboratory testing for HIV among a population-based sample. Analyses restricted to the sample of husbands to those whose wives were not HIV infected afforded greater empirical clarity than previously possible in testing hypotheses that abusive husbands are at greater risk for acquiring HIV outside the marital relationship and subsequently introducing it to their wives. Both men's IPV perpetration and their sexual risk behavior are increasingly considered to stem from a common source, specifically socially sanctioned norms of masculinity that prioritize sexual entitlement and multiple partnering, and physical and sexual domination of female partners.^{15, 33, 34} As such, the India National Aids Control Organization (NACO) has recognized social norms endorsing men's sexual entitlement and power over women as a factor in women's HIV vulnerability.³⁵ Supporting the import of

modifying such factors, recent efforts targeting the intersection of men's sexual risk and abusive behavior have been demonstrated effective in reducing both men's violence perpetration and incident STI in the African context;³⁶ similar efforts underway in India should be prioritized as they hold promise in modifying masculinity norms to reduce both IPV and HIV/STI.³⁴

Current evidence of facilitated HIV transmission to female partners in the presence of IPV (i.e., IPV as a risk factor), similarly advances the current state of knowledge. Use of matched husband-wife dyads with integrated HIV test results allowed assessment of the differential impact of wives' exposure to their husbands' HIV across violent and non-violent relationships, with women whose husbands were violent suffering approximately seven times the risk of becoming infected with HIV based on exposure to their husband's infection. Prior work suggests a number of mechanisms for women's greater likelihood of HIV infection based on exposure to husband HIV in the presence of violence. The role of unwanted sex and subsequent physical trauma (i.e., tearing or lacerations)^{23, 29} associated with IPV is likely critical in increasing opportunity for infection transmission. Cultural norms dictate low levels of sexual communication between spouses concerning sexuality among this population generally;²⁷ abused women's limited ability to negotiate or refuse sex in the face of violence, coupled with unwanted sex obtained via physical force and a range of coercive tactics,^{13,26, 27,35, 37} likely facilitate trauma and HIV transmission. Qualitatively riskier sexual practices, e.g., anal sex, found more common among male IPV perpetrators³⁸ may also constitute an enhanced transmission mechanism within abusive relationships. While condom use was relatively rare within the current sample of married couples, evidence from India of violence in response to condom requests by wives^{26, 27} suggests that abused women's limited ability to negotiate condom use (e.g., in the context of wives' knowledge of his HIV infection or suspicion of extramarital sexual risk behavior) may increase risk of HIV transmission, even within this low-use setting. Further investigations using husband-wife dyads as the unit of analysis across other national and high-risk contexts are recommended to advance the empirical basis for these hypothesized mechanisms and clarify the present findings.

Limitations of the current study include the inability to establish a temporal relationship based on the cross-sectional nature of the study, thus incident and secondary infections among concordant husband-wife dyads cannot be disentangled. While the analyses were based on a conceptual framework positing that husbands may be more likely to introduce HIV to the relationship, it is not possible to rule out the possibility that wives introduced HIV infection within concordant couples, although this appears unlikely based on the current findings that wives' sexual risk was not associated with their HIV infection. Low levels of prior HIV testing in this sample⁴ suggests that the majority of participants were unaware of their HIV status at the time of testing, limiting concerns that IPV could have been caused by HIV disclosure.^{39, 40} Although procedures entailing multiple testing and external quality control enhanced the precision of HIV assessment, misclassification is possible and the low prevalence of HIV renders analyses sensitive to potential misclassification. While potential misclassification could limit the precision of estimates, misclassification is not likely to be differential relative to IPV, thus minimizing bias. The IPV assessment was dichotomized for ease in interpretation; further investigation is needed to evaluate the extent to which patterns identified may vary across severity levels and types (i.e., physical and sexual) violence. The self-reported nature of sexual risk behaviors by both male and female participants renders these measures imprecise.

The findings from this population-based study of IPV and HIV in India bolster the hypothesis that abused women face "double jeopardy," i.e., compounded risk for HIV infection based on both abusive husbands' greater likelihood of HIV infection and facilitated

HIV transmission within abusive relationships. Patterns identified likely extend to other STIs that, while treatable, demonstrate higher population prevalence within the Indian context and elsewhere.^{25, 41, 42} The current evidence that IPV serves both as a risk marker for greater likelihood of HIV infection and as a direct HIV transmission mechanism serves to echo calls for simultaneous modification of men's sexual risk behavior and reduction of violence perpetration against female partners both within South Asia and elsewhere.^{12, 15} As IPV may function to facilitate HIV transmission, the reduction of men's sexual risk in the absence of reducing their abuse of female partners may fall critically short of stemming the secondary transmission of HIV and other STIs. Given evidence that over one in three women face abuse at the hands of their husbands both in the current sample and worldwide,⁴³ the need for prevention to stem the interwoven threats of IPV and HIV to women's health and well-being cannot be overstated.

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Table 1

Sample demographics, HIV risk factors and associations with IPV perpetration and HIV infection among Indian husbands (n=20,425)

	Sample %(95% CI) ^d	IPV %(95% CI) ^b	p value ^c	Men's HIV infection %(95% CI) ^b	p value ^c
Total	100.0	37.4 (36.1, 38.7)		0.4 (0.3, 0.5)	
<i>Men's Demographics</i>					
Men's Age			0.496		0.334
24 and under	6.4 (5.9, 7.1)	35.5 (31.1, 40.2)		0.2 (0.1, 0.6)	
25-29	15.0 (14.2, 15.9)	36.4 (33.5, 39.4)		0.3 (0.2, 0.5)	
30-34	20.5 (19.7, 21.4)	36.7 (34.3, 39.2)		0.5 (0.3, 0.8)	
35-39	21.5 (20.6, 22.4)	39.3 (36.8, 41.8)		0.6 (0.3, 0.9)	
40-44	16.6 (15.8, 17.5)	36.2 (33.7, 38.9)		0.4 (0.2, 0.6)	
45 and over	19.9 (19.1, 20.8)	37.9 (35.5, 40.4)		0.4 (0.2, 0.9)	
Men's Education ^d			<0.001		0.155
None	24.7 (23.5, 25.9)	48.1 (45.5, 50.7)		0.4 (0.2, 0.8)	
Primary	21.3 (20.3, 22.2)	44.1 (41.6, 46.6)		0.6 (0.4, 1.0)	
Secondary or higher	54.1 (52.7, 55.5)	29.7 (28.2, 31.2)		0.3 (0.2, 0.5)	
Household Wealth Index			<0.001		0.401
Poorest	20.0 (18.8, 21.4)	50.4 (47.3, 53.5)		0.5 (0.2, 1.0)	
Poorer	20.3 (19.2, 21.3)	46.7 (43.9, 49.5)		0.3 (0.2, 0.6)	
Middle	20.6 (19.6, 21.6)	39.7 (37.3, 42.2)		0.5 (0.3, 0.7)	
Richer	19.5 (18.5, 20.6)	32.3 (30.1, 34.6)		0.5 (0.4, 0.8)	
Richest	19.6 (18.4, 20.9)	16.7 (14.9, 18.7)		0.3 (0.2, 0.5)	
Men's Religion			<0.001		0.403
Hindu	82.9 (81.5, 84.1)	37.3 (36.0, 38.7)		0.4 (0.3, 0.5)	
Muslim	11.3 (10.2, 12.6)	40.9 (37.0, 44.9)		0.4 (0.1, 1.4)	
Other	5.8 (5.3, 6.5)	29.8 (26.0, 33.9)		0.8 (0.4, 1.7)	
<i>Men's HIV Risk</i>					
Lifetime sex partners ^e			<0.001		0.013

	Sample %(95% CI) ^a	IPV %(95% CI) ^b	p value ^c	Men's HIV infection % (95% CI) ^b	p value ^c
1	81.9 (80.9, 82.8)	36.1 (34.8, 37.5)		0.3 (0.2, 0.5)	
>1	18.3 (17.4, 19.3)	42.8 (40.2, 45.5)		0.7 (0.5, 1.1)	
Lifetime condom use ^f			<0.001		0.278
Yes	28.6 (27.5, 29.9)	30.6 (28.6, 32.6)		0.3 (0.2, 0.6)	
No	71.4 (70.1, 72.6)	40.0 (38.5, 41.5)		0.5 (0.3, 0.6)	
Circumcision ^g			0.431		0.918
Yes	11.7 (10.6, 12.9)	38.7 (35.0, 42.5)		0.4 (0.1, 1.4)	
No	88.3 (87.1, 89.5)	37.1 (35.8, 38.5)		0.4 (0.3, 0.5)	

^aExcept where denoted otherwise, the denominator represents 20,425 Indian husbands for whom IPV and HIV data were available.

^brow percent is presented

^cWald chi-square p value

^dExcludes 8 participants for whom education data were missing

^eExcludes 48 participants for whom lifetime number of sex partners was missing

^fExcludes 24 participants whose lifetime history of condom use was missing

^gExcludes 158 participants whose circumcision status was unknown

Table 2

Sample demographics, HIV risk factors and associations with IPV victimization and HIV infection among Indian wives (n=20,425)

	Sample % ^a (95% CI)	IPV % ^b (95% CI)	p value ^c	Women's HIV infection % ^b	p value ^c
Total	100	37.4 (36.1, 38.7)		0.2 (0.1, 0.3)	
Women's Age			0.125		0.404
24 and under	22.7 (21.73, 23.6)	34.9 (32.6, 37.4)		0.2 (0.1, 0.4)	
25-29	22.7 (21.8, 23.6)	38.7 (36.4, 41.1)		0.2 (0.1, 0.4)	
30-34	22.2 (21.3, 23.1)	38.4 (36.1, 40.9)		0.3 (0.2, 0.6)	
35-39	16.2 (15.4, 17.1)	38.4 (35.7, 41.2)		0.1 (<0.1, 0.3)	
40 and over	16.2 (15.4, 17.1)	36.5 (33.9, 39.3)		0.1 (0.1, 0.4)	
Women's Education ^d			<0.001		0.445
None	46.9 (45.5, 48.3)	47.1 (45.2, 49.0)		0.2 (0.1, 0.3)	
Primary	15.8 (14.9, 16.6)	40.4 (37.6, 43.2)		0.3 (0.1, 0.6)	
Secondary or higher	37.3 (36.0, 38.7)	24.0 (22.4, 25.6)		0.1 (0.1, 0.3)	
Household Wealth Index			<0.001		0.123
Poorest	20.1 (18.8, 21.4)	50.5 (47.5, 53.6)		0.1 (<0.1, 0.2)	
Poorer	20.3 (19.2, 21.3)	46.8 (44.0, 49.6)		0.3 (0.1, 0.5)	
Middle	20.6 (19.6, 21.7)	39.8 (37.3, 42.3)		0.1 (<0.1, 0.2)	
Richer	19.5 (18.5, 20.5)	32.4 (30.2, 34.7)		0.3 (0.2, 0.7)	
Richest	19.6 (18.4, 20.9)	16.8 (14.9, 18.8)		0.2 (0.1, 0.4)	
Women's Religion			<0.001		0.028
Hindu	82.7 (81.4, 84.0)	37.4 (36.1, 38.8)		0.2 (0.1, 0.3)	
Muslim	11.3 (10.1, 12.6)	41.0 (37.1, 45.0)		0.1 (<0.1, 0.3)	
Other	6.0 (5.4, 6.6)	30.1 (26.3, 34.1)		0.1 (<0.1, 0.3)	
Women's Sexual Risk					
Lifetime sex partners ^e			<0.001		0.495
1	98.5 (98.2, 98.8)	37.2 (35.9, 38.4)		0.2 (0.1, 0.3)	

	Sample % ^a (95% CI)	IPV % ^b (95% CI)	p value ^c	Women's HIV infection % ^b	p value ^c
>1	1.5 (1.2, 1.8)	54.8 (45.4, 63.8)		0.4 (0.1, 2.2)	
Lifetime condom use ^f			<0.001		0.807
Yes	16.2 (15.3, 17.2)	33.1 (30.4, 35.8)		0.2 (0.1, 0.6)	
No	83.8 (82.9, 84.8)	38.3 (36.9, 39.7)		0.2 (0.1, 0.3)	

^aExcept where denoted otherwise, the denominator represents 20,425 Indian wives for whom IPV and HIV data were available.

^brow percent is presented

^cWald chi-square p value

^dExcludes one (1) participant for whom education data were missing

^eExcludes 40 participants for whom lifetime number of sex partners was missing

^fExcludes 30 participants for whom lifetime condom use data were missing

Table 3

Associations of IPV perpetration and sexual covariates with HIV infection among Indian husbands whose wives are not HIV infected (n=20,358)^a

	Unadjusted		Adjusted	
	OR (95% CI)	p value ^c	AOR ^b (95% CI)	p value ^c
Any Violence Perpetration				
No	-ref-		-ref-	
Yes	1.94 (1.02, 3.69)	0.043	1.91 (1.11, 3.27)	0.019
>1 lifetime sex partner				
No	-ref-		-ref-	
Yes	1.61 (0.84, 3.07)	0.149	1.60 (0.82, 3.11)	0.166
Lifetime condom use				
None	-ref-		-ref-	
Any	0.68 (0.33, 1.40)	0.291	0.67 (0.33, 1.34)	0.255
Circumcised				
No	-ref-		-ref-	
Yes	1.32 (0.34, 5.13)	0.690	1.37 (0.36, 5.24)	0.649

^a Missing data was imputed as follows: 8 participants missing education data was coded as having no education, 24 participants missing data on condom use were coded as having never used condoms, 48 participants missing data on lifetime number of sex partners were coded to the referent group of having had only 1 lifetime partner, and 158 participants with unknown circumcision status were coded as not having been circumcised.

^b Wald chi-square p value adjusted for men's age, men's education, household wealth index, and all covariates in the table

^c adjusted for men's age, men's education, household wealth index, and all covariates in the table

Table 4

Associations of husband HIV infection and IPV victimization with HIV among Indian wives (n=20,425)^a

	Entire Sample n=20,425		Any IPV Yes n=7,147		Any IPV No n=13,278		Entire Sample n=20,425	
	AOR ^b (95% CI)	p value ^c	AOR ^b (95% CI)	p value ^c	AOR ^b (95% CI)	p value ^c	AOR ^d (95% CI)	p value ^c
Husband HIV infected	740.40 (308.08, 1777.42)	<0.001	4610.88 (858.96, 24751.04)	<0.001	544.97 (198.38, 1497.09)	<0.001	539.13 (198.19, 1466.58)	<0.001
Exposed to IPV AND Husband HIV	--		--		--		7.22 (1.05, 49.88)	0.045
Women's sexual risk								
>1 lifetime sex partner	0.80 (0.11, 5.79)	0.823	1.69 (0.05, 53.21)	0.766	0.55 (0.07, 4.42)	0.573	0.83 (0.11, 6.23)	0.853
Lifetime condom use	0.91 (0.22, 3.82)	0.894	1.14 (0.08, 15.45)	0.921	0.82 (0.13, 5.07)	0.827	0.97 (0.23, 4.02)	0.963

^aMissing data were imputed as follows: 1 participant missing education data was coded as having no education, 30 participants missing data on condom use were coded as having never used condoms, 40 participants missing data on lifetime number of sex partners were coded to the referent group of having had only 1 lifetime partner

^badjusted for women's age, women's education, women's religion, household wealth index, and all covariates in the column

^cWald chi-square p value

^dadjusted for women's age, women's education, women's religion, household wealth index, IPV, and all covariates in the column