Intimate Partner Violence and HIV Infection Among Married Indian Women

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Context Despite reductions in prevalence of human immunodeficiency virus (HIV) infection among the general population of India, women account for a rising percentage of all HIV cases with husbands' risk behavior described as the major source of women's infection. Intimate partner violence (IPV) has been described as being associated with heterosexual transmission of HIV to women in India and elsewhere.

Objective To assess the relationship between experiencing IPV and the occurrence of HIV infection in a nationally representative sample of married Indian women tested for HIV.

Design, Setting, and Participants The Indian National Family Health Survey 3 was conducted across all Indian states in 2005 through 2006. The nationally representative sample included 124 385 married women; analyses conducted in 2007 and 2008 were limited to 28 139 married women who provided IPV data and HIV test results via systematic selection into respective subsamples.

Main Outcome Measures Prevalence estimates of lifetime IPV and HIV infection were calculated and demographic differences assessed. Intimate partner violence was conceptualized as physical violence with or without sexual violence and then was further categorized as physical violence only vs physical and sexual violence. Regression models were used to estimate the odds ratios (ORs) and 95% confidence intervals (CIs) for HIV infection among Indian women based on experiences of IPV after adjusting for demographics and women's HIV risk behaviors.

Results One-third of married Indian women (35.49%) reported experiencing physical IPV with or without sexual violence from their husbands; 7.68% reported both physical and sexual IPV, and 27.80% reported experiencing physical IPV in the absence of sexual violence. Approximately 1 in 450 women (0.22%) tested positive for HIV. In adjusted models, married Indian women experiencing both physical and sexual violence from husbands demonstrated elevated HIV infection prevalence vs those not experiencing IPV (0.73% vs 0.19%; adjusted OR, 3.92; 95% CI, 1.41-10.94; $P=.01$). Physical IPV alone was not associated with risk of HIV infection. Women's personal sexual risk behaviors were not associated with HIV infection.

Conclusions Among married Indian women, physical violence combined with sexual violence from husbands was associated with an increased prevalence of HIV infection. Prevention of IPV may augment efforts to reduce the spread of HIV/AIDS.

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INDIA IS HOME TO APPROXIMATELY 2.5 million people living with human immunodeficiency virus (HIV), the third largest number of cases of any country in the world,[1,2] and is recognized as the source of increasing HIV prevalence among its South Asian neighbors.[2-4] Recently released national HIV prevalence estimates for India indicate that 0.22% of women and 0.36% of men aged 15 to 49 years are infected.[5] Despite recent reductions in HIV prevalence among both the general population and many high-risk groups, the percentage of all infections occurring among Indian women (currently estimated at 39%) has continued to rise relative to that among men.[4,6] Husbands' extramarital risk behavior (eg, unprotected extramarital sex and sex with commercial sex workers) is described as the most likely source of infection, with approximately 90% of HIV-positive Indian women reported to be married and monogamous.[4,7-10]

Mounting evidence highlights the relevance of intimate partner violence (IPV) in understanding HIV infection patterns among women, both in the South Asian context and elsewhere. High rates of IPV are consistently documented among South Asian women,[11-18] and growing evidence indicates elevated rates of sexual risk behaviors (eg, extramarital and multiple sex partners, no or inconsistent condom use, and forced unprotected sex) and sexually transmitted infections (STIs) among abusive men.[19-26] Further, studies in both South Asia and the United States have found elevated rates of women's self-reported STI symptoms and incident STI diag-

See also Patient Page.

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nosis based on IPV experiences.[27-30] These data have prompted increasing recognition of pathways by which male violence against female partners may both be a marker for and directly facilitate (ie, be a mechanism for) sexual transmission of HIV to women in India[18,31] and elsewhere.[32,33] Specifically, the extramarital high-risk sexual behavior of abusive men appears to relate to a higher prevalence of HIV among this group; thus, IPV may act as a risk marker in that it relates to the higher likelihood of an infected partner. However, unprotected forced sex or unprotected coercive sex perpetrated by abusive men within marriage may constitute a direct mechanism, possibly facilitating HIV transmission to wives.[18,32-34]

A small number of studies have incorporated objective assessment of HIV infection (ie, diagnostic testing) in examining associations of women's HIV infection with IPV within voluntary counseling and testing or STI clinics; such efforts have demonstrated elevated HIV infection among women who have experienced violence from partners.[35,36] However, low levels of HIV knowledge and risk perception among Indian women[37] imply significant underutilization of STI/HIV clinical services among this group, suggesting limited generalizability to the broader population. Outside of South Asia, a large study based in 4 South African antenatal clinics similarly identified elevated HIV seropositivity among women experiencing IPV.[38] Because of potential differences in antenatal service utilization relative to both HIV risk[5] and IPV experience,[39] possibly limiting the ability of such a design to detect cases of interest, population-based studies of the relation of IPV and diagnosed HIV are needed.

The India National Family Health Survey 3 (NFHS-3) represents the first large-scale, population-based data on IPV integrating results of HIV testing for India or any other region. The present study attempts to advance the current state of knowledge by assessing the prevalence of HIV infection among married Indian women and evaluating the relationship of women's experiences of physical and sexual violence from husbands to their HIV infection.

METHODS

Sample

The present study is based on data from the India NFHS-3, a national survey conducted in all 29 states of India from November 2005 to August 2006 by the International Institute for Population Sciences and Macro International. The NFHS (referred to as the Demographic and Health Survey [DHS] in other national contexts) is regularly conducted in many developing countries to obtain population-based estimates of major health concerns and risk behaviors. A nationally representative household-based sample was created via a stratified, multistage cluster sampling strategy. Within each state, 2-stage (rural areas) and 3-stage (urban areas) procedures selected a total of 3850 primary sampling units (PSUs) comprising 1 or more villages in rural areas and census enumeration blocks within wards in urban areas; PSU selection probability was proportional to population size. Household enumeration conducted within each PSU formed the sampling frame for systematic selection of households. These procedures identified 131 596 women aged 15 to 49 years eligible for participation, of which 124 385 completed the survey for a response rate of 95%.[5] Participants were recruited in their homes by trained research assistants who asked them if they would be willing to participate in a national study on health; written informed consent was obtained immediately prior to survey data collection. Participants provided written consent for the survey component and, if eligible, provided written consent for HIV testing. Participants were read a standard informed consent document, which indicated that they were being asked to participate in a national health study, that their participation was voluntary, and that they had the option to withdraw at any time. Consistent with standard procedures, potential participants had an opportunity to have questions answered prior to consent and were provided with a contact from the local human subjects committee in the event of future questions. Further details of data collection and management procedures are available elsewhere.[5]

The analytic sample was limited to currently married female participants for whom both outcome (HIV test results) and exposure data (IPV) were available. Based on logistical and fiscal considerations, separate systematic sampling procedures were used to select subsamples of participants for both HIV testing and the IPV survey module. Because of local opposition to HIV testing in Nagaland, 3896 of 124 385 female participants (3%) from this state were excluded from this component. Among participants from the remaining Indian states, 58 202 of 120 489 were systematically selected (49%) for HIV testing, of whom 52 853 (91%) participated subsequent to providing their written informed consent for HIV testing. Of the 52 853 female survey participants tested for HIV, 37 539 (71%) were currently married, thus meeting inclusion criteria for the current analytic sample.

The analytic sample was further restricted to female participants who were also systematically selected to complete the IPV survey module. Although the overall sampling strategy allowed for multiple female participants per household, a separate systematic procedure selected a single nonchild (aged 15 years or older) female participant to complete the IPV assessment; the purpose was to prevent risk to any individual based on subsequent discussion of the assessment among participating household members. Of the total 124 385 female survey participants, 84 268 (68%) were selected for, and 83 703 (99%) completed the IPV module. Survey interviewers were trained to administer the module only when privacy could be ensured. Of the 83 703 women who completed the IPV assess-

ment, 65 610 (78%) were currently married, thus meeting inclusion criteria for the current study.

Our analytic sample was further restricted to 35 756 female survey participants based on completion of both HIV testing and provision of IPV data; specifically, IPV data were available for 35 756 survey participants (68%) with HIV test results, and HIV test results were available for 35 756 survey participants (43%) with IPV data. Of the 35 756 female survey participants with both HIV test results and IPV data, 7599 were eliminated because they were not currently married; the remaining 28 157 women (79%) were included in the current analyses. An additional 10 participants were excluded based on incomplete IPV data, and 8 were excluded based on reporting no history of sexual intercourse, resulting in a final analytic sample of 28 139. Based on the nature of the analytic subsample, a response rate was not computed directly from the final sample and response rates are provided instead for the underlying components for which participants were asked to participate.

Measures

Questionnaires were administered verbally via a trained interviewer to minimize potential literacy barriers in either English or the principal language of each Indian state based on the preference of household members. Demographics including age, religion, and education were assessed via single items. A relative index of household wealth was calculated based on interviewer-observed assets, including ownership of consumer items and dwelling characteristics; individuals were ranked based on their household score and divided into quintiles, with 1 representing the poorest 20% and 5 representing the wealthiest 20% of households. Self-reported lifetime number of sexual partners and lifetime history of condom use for contraceptive purposes were assessed via single items and considered as sexual risk covariates. No data concerning race/ethnicity were collected as part of the study.

The Domestic Violence Module for the DHS included in the NFHS-3 was based on a modification of the Conflict Tactics Scale[40] and developed in accordance with World Health Organization (WHO) recommendations for population-based IPV surveillance.[41] Physical IPV was assessed via 6 items pertaining to lifetime experience of violence from a woman's current husband. Physical IPV was indicated by a positive response to any one of the following experiences at the hands of a partner: "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," or "threaten or attack you with a knife, gun, or any other weapon." Cronbach α for this measure was .75. A positive response to a husband having ever "physically forced you to have sexual intercourse with him even when you did not want to" or "forced you to perform any sexual acts that you did not want to" indicated sexual IPV. Women reporting either physical or physical and sexual IPV were classified as having experienced "any physical IPV." These assessments were further recoded to create a 3-level categorical variable reflecting 2 categories of lifetime physical IPV (ie, physical IPV only and physical IPV with forced sex) with no IPV as the referent group for all logistic analyses.

The primary outcome of HIV infection was assessed via collection of dried blood spots at the time of survey data collection. The SRL Ranbaxy laboratory (Mumbai, India) provided enzyme-linked immunosorbent assay (ELISA) HIV antibody testing (Microlisa; J. Mitra & Co, New Delhi, India) and compilation of results. Consistent with WHO/Joint United Nations Programme on HIV/AIDS (UNAIDS) guidelines for population-based HIV seroprevalence assessment,[42] a sequential multiple testing protocol was followed whereby all positive results and 5% of negative results diagnosed via the first ELISA (Microlisa) were tested with a second ELISA (Enzaid-Span 3; Span Diagnostics, Surat, India). The Innolia Western blot kit (Innogenetics, Ghent, Belgium) was used to confirm nonmatching results. All participants consenting to the anonymous linked test procedure were subsequently referred to no-cost HIV counseling and testing at collaborating voluntary counseling and testing centers in their local area. The International Institute for Population Sciences (Mumbai, India), which serves as a regional center for teaching, training, and conducting research in population studies, is under administrative control of the Ministry of Health and Family Welfare, Government of India, and serves as the country-level implementing organization for the NFHS. The institute conducts an independent ethics review of NFHS protocols, including the NFHS-3. Data collection procedures were approved by the ORC Macro institutional review board; the Harvard School of Public Health reviewed the analytic study of the data presented herein and concluded that analyses were exempt from full institutional review board review based on the data being publicly available and the anonymous nature of the database.

Analyses of these data were conducted from November 2007 to March 2008. The NFHS-3 generated data that were made publicly available for use by researchers and practitioners alike and has formed the basis for previous publications.

Statistical Analysis

The prevalence estimates of lifetime IPV and HIV infection were calculated for the overall sample and by demographics and sexual risk factors. Differences in IPV exposure and HIV infection based on demographics and sexual risk were assessed via Wald χ^2 analyses; the 2-tailed significance level for all analyses was $P < .05$. A logistic regression model was first constructed to estimate the odds ratio (OR) and 95% confidence interval (CI) for the association of any physical IPV with women's HIV infection. Subsequently, IPV was considered as a categorical variable to

better clarify the independent contributions regarding HIV infection of physical abuse in the absence of sexual violence, and physical abuse in combination with sexual violence, using as the referent group the respondents who indicated no physical IPV. After determining the crude (ie, unadjusted) relations, models were adjusted for major demographics (age, education, and household wealth); based on insufficient numbers of HIV-infected Muslim women in the current sample (n=4), religion could not be assessed as a predictor of HIV status in adjusted analyses. Also entered into adjusted models were behaviors related to HIV risk (lifetime number of sex partners and lifetime history of condom use). Estimates generated via logistic regression were evaluated for statistical significance based on 95% CIs not crossing 1.0; reported ORs should not be misinterpreted as relative risks.[43] To maximize statistical power for multivariate analyses, missing data were handled as follows: 1 participant missing data concerning education was coded as having no education, 35 participants missing data on condom use were coded as having never used condoms, and 64 participants missing data regarding number of lifetime sex partners were coded to the referent group (ie, having 1 lifetime partner). Sensitivity analyses indicated that no effect estimate was modified by 1% or more based on these procedures. Power calculations indicated that the current sample of 28 139 women would allow for detection of ORs as fine as 2.0 with 85% power, assuming a 35% IPV prevalence and a 0.2% HIV prevalence. Statistical analyses were performed with Stata version 9 (StataCorp, College Station, Texas)[44] to appropriately account for the complex sampling design of the NFHS-3. All analyses were weighted to account for selection probability and nonresponse using the HIV testing weight for the entire women's sample standardized to the current analytic sample size.

Table 1. Sample Demographics and Sexual Risk and Associations With Lifetime IPV and HIV Infection Among Currently Married Indian Women (N = 28 139)

	% (95% CI)		
	Sample[a]	IPV[b]	HIV[b]
Total		35.49 (34.38-36.61)	0.22 (0.16-0.30)
Age, y			
≤24	23.32 (22.48-24.23)	31.83 (29.82-33.92)	0.21 (0.10-0.46)
25-29	22.19 (21.42-22.98)	36.55 (34.56-38.59)	0.21 (0.13-0.35)
30-34	20.75 (20.01-21.53)	37.00 (34.89-39.16)	0.36 (0.20-0.67)
35-39	15.48 (14.80-16.19)	37.02 (34.67-39.43)	0.18 (0.09-0.35)
≥40	18.24 (17.50-19.00)	35.84 (33.69-38.06)	0.13 (0.06-0.28)
P value[c]		.002	.40
Education[d]			
None	47.30 (46.01-48.58)	44.83 (43.18-46.49)	0.25 (0.16-0.38)
Primary	15.77 (15.04-16.52)	38.74 (36.33-41.22)	0.33 (0.15-0.71)
Secondary or higher	36.94 (35.73-38.16)	22.13 (20.82-23.50)	0.15 (0.09-0.24)
P value[c]		<.001	.15
Religion			
Hindu	81.43 (80.11-82.68)	35.36 (34.15-36.59)	0.26 (0.19-0.36)
Muslim	12.79 (11.61-14.07)	39.28 (35.96-42.71)	0.06 (0.02-0.18)
Other	5.78 (5.27-6.34)	28.86 (25.61-32.35)	0.07 (0.02-0.21)
P value[c]		<.001	<.001
Wealth index			
Poorest	20.00 (18.86-21.20)	47.31 (44.71-49.93)	0.11 (0.05-0.23)
Poorer	20.56 (19.63-21.51)	45.17 (42.75-47.62)	0.25 (0.14-0.45)
Middle	20.02 (19.15-20.93)	37.92 (35.79-40.09)	0.21 (0.09-0.48)
Richer	19.47 (18.57-20.41)	30.43 (28.46-32.48)	0.41 (0.23-0.73)
Richest	19.94 (18.78-21.15)	16.13 (14.59-17.79)	0.14 (0.07-0.28)
P value[c]		<.001	.11
Sexual risk			
Lifetime sex partners[e]			
1	98.35 (98.08-98.58)	35.24 (34.13-36.36)	0.22 (0.16-0.30)
>1	1.65 (1.42-1.92)	52.23 (44.51-59.84)	0.63 (0.21-1.83)
P value[c]		<.001	.24
Lifetime condom use[f]			
Yes	15.26 (14.47-16.07)	31.41 (29.11-33.8)	0.18 (0.07-0.46)
No	84.74 (83.93-85.53)	36.24 (35.06-37.45)	0.23 (0.17-0.32)
P value[c]		<.001	.63

Abbreviations: CI, confidence interval; HIV, human immunodeficiency virus; IPV, intimate partner violence.
[a] Except where denoted otherwise, the denominator represents 28 139 currently married female participants for whom both IPV and HIV data were available. All analyses are weighted for nonresponse. Because of the complex survey design, weighting of descriptive analyses was necessary. To avoid confusion between actual number of observations for each parameter and weighted proportions (ie, raw numbers will not match weighted percentages), the number of observations is not listed in the table.
[b] Row percentage.
[c] Wald χ^2 test.
[d] Excludes 1 participant for whom education data were missing.
[e] Excludes 64 participants for whom data on lifetime number of sex partners were missing.
[f] Excludes 35 participants for whom lifetime condom use data were missing.

RESULTS

Analyses indicated that greater than one-third (35.49%; 95% CI, 34.38%-36.61%) of married Indian women participating in the NFHS-3 (data collected November 2005 through August 2006), and meeting inclusion criteria for the current study, reported experiencing physical violence with or without sexual violence from their husbands (TABLE 1); 27.80% experienced physical IPV alone while the remaining 7.68% experienced both physical and sexual IPV (TABLE 2). Slightly more than 1 in 450 (0.22%; 95% CI, 0.16%-0.30%) tested positive for HIV (Table 1). A lower prevalence of IPV was identified among those aged 15 to 24 years (31.83%), with secondary edu-

cation or higher (22.13%), and with the highest category of relative household wealth (16.13%) as compared with older, less educated, and poorer women based on nonoverlapping CIs (all $P<.01$). Similarly, those reporting a religious affiliation other than Hindu or Muslim were less likely to report IPV (28.86%) as compared with members of these primary Indian religions (35.36% and 39.28%, respectively, $P<.001$). The only demographic factor related to HIV status was religion; a higher HIV infection prevalence was identified among Hindus as compared with women from Muslim and other religious backgrounds (0.26% vs 0.06% and 0.07%, respectively, $P<.001$).

The vast majority of married Indian women (98.35%; 95% CI, 98.08%-98.58%) reported having 1 lifetime sex partner; a lower prevalence of IPV was identified among these individuals as compared with those reporting multiple lifetime sex partners (35.24% vs 52.23% respectively, $P<.001$). The majority (84.74%; 95% CI, 83.93%-85.53%) of participants also reported never using a condom; those reporting condom use during their lifetime demonstrated a lower IPV prevalence as compared with those reporting no use (31.41% vs 36.24%, $P<.001$). No differences in HIV infection prevalence were observed based on women's sexual risk behaviors (number of lifetime sex partners and lifetime condom use).

In logistic regression models, both crude and adjusted for demographics and sexual risk factors, married Indian women who experienced both physical and sexual IPV (7.68% of the sample) were found to suffer significantly increased prevalence of HIV infection as compared with those not experiencing violence from husbands (0.73% vs 0.19% HIV prevalence; OR, 3.81; 95% CI, 1.49-9.76; adjusted OR, 3.92; 95% CI, 1.41-10.94) (Table 2). Other forms of IPV assessed were not observed to relate to HIV infection among the current sample. Across adjusted analyses of the relationship of forms of IPV to HIV status, neither number of lifetime sex partners nor lifetime condom use related to women's HIV infection (ie, all CIs included 1.0).

COMMENT

In this first national population-based study of the relationship of husbands' violence against wives to wives' HIV infection status (as indicated via diagnostic testing), married Indian women who experienced both physical and sexual IPV demonstrated an HIV infection prevalence approximately 4 times greater than that of nonabused women. Importantly, women's HIV infection was not related to their own sexual risk behaviors (condom use and multiple partnering), with HIV infection prevalence not differing at $P<.05$ based on report of either of these behaviors. These findings support descriptions of the Indian HIV epidemic among married women as driven primarily by the behavior of men[9,18] and highlight the potential role of men's abusive behaviors in posing HIV risk to their female partners.

Current findings that exposure to combined physical and sexual violence from husbands related to increased HIV prevalence, whereas physical violence in the absence of sexual violence did not, are consistent with prior work demonstrating elevated STI/HIV prevalence based on qualitatively more severe levels of violence from partners.[21,24,38] Potential explanations for this pattern include physical trauma (eg, tearing and lacerations) resulting from forced sex[45] and higher levels of sexual risk behaviors and STI documented among South Asian men enacting both physical and sexual abuse as compared with those reporting only physical abuse.[21,24]

Further work is needed to clarify whether exposure to IPV is best considered a risk marker for sex with a potentially high-risk partner[19-26]; a risk factor, that is, a direct facilitator of HIV infection (eg, based on unprotected forced sex or unprotected coerced sex)[22,27]; or both. As described earlier, recent surveillance data indicate that India, like many other major centers of HIV infection, is facing increasing feminization of the HIV epidemic[46-48]; that is, infection among women accounts for an increasing percentage of HIV cases.

Table 2. Associations of Lifetime IPV With HIV Infection Among Currently Married Indian Women (n = 28 139)

	% (95% CI)					
	Sample[a]	HIV Positive[b]	HIV Negative[b]	Odds Ratio (95% CI)[c]	AOR (95% CI)[c,d,e]	*P* Value[f]
Any violence						
No violence	64.51 (63.39-65.62)	0.19 (0.13-0.27)	99.81 (99.73-99.87)	1 [Reference]	1 [Reference]	
Any physical IPV	35.49 (34.38-36.61)	0.28 (0.17-0.48)	99.72 (99.52-99.83)	1.48 (0.78-2.81)	1.53 (0.76-3.06)	.23
Type of violence						
No violence	64.51 (63.39-65.62)	0.19 (0.13-0.27)	99.81 (99.73-99.87)	1 [Reference]	1 [Reference]	
Physical IPV without sexual IPV	27.80 (26.80-28.84)	0.16 (0.10-0.27)	99.84 (99.73-99.90)	0.84 (0.45-1.57)	0.89 (0.46-1.71)	.72
Physical IPV with sexual IPV	7.68 (7.04-8.37)	0.73 (0.31-1.71)	99.28 (98.29-99.69)	3.81 (1.49-9.76)	3.92 (1.41-10.94)	.01

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; HIV, human immunodeficiency virus; IPV, intimate partner violence.
[a] Denominator for all analyses is 28 139.
[b] Row percentage.
[c] Odds ratios should not be misinterpreted as relative risks.[43]
[d] Adjusted for age, education, household wealth, lifetime number of sex partners, and lifetime condom use.
[e] Missing data were imputed as follows: 1 participant missing data concerning education was coded as having no education, 35 participants missing data on condom use were coded as having never used condoms, and 64 participants failing to report number of lifetime sex partners were coded as having had only 1 lifetime partner.
[f] Wald χ^2 test.

In such instances, men's risk behavior as well as women's lack of control over sex or sexual protection have been implicated in these trends.[33] As abusive men have been found to demonstrate both higher levels of sexual risk behavior[21,22,24,49] and, as an inherent aspect of their abuse, higher levels of control over sex and sexual protection,[22,24,31,50,51] women experiencing IPV face "double jeopardy" regarding risk for HIV infection from male partners (ie, they are likely to hold little control over sexual protection with a high-risk male partner). Thus, IPV may represent both a risk marker and risk factor for increased HIV prevalence among women. Current findings of Indian women's elevated HIV infection based on their reports of physical and sexual violence from their husbands demonstrate the need for further research to confirm the specific potential mechanisms and to disentangle the roles of abusive men's risky behavior outside the relationship and sexual violence within the relationship in posing HIV risk to their female partners.

Indian women's own sexual risk behaviors (condom use and multiple partnering) did not relate to their HIV infection status, a finding that both corroborates and contrasts with prior work from the South African context. Some evidence from this high-prevalence country supports an effect of IPV on women's HIV infection after accounting for women's sexual risk[38] while other research has demonstrated attenuation of relations of IPV and HIV infection among women after consideration of female sexual risk behavior.[52] Notably, discrepancies between levels of sexual risk behavior among these 2 contexts are quite large; for example, less than 2% of Indian married women reported having more than 1 lifetime sex partner, as compared with 44% of antenatal clinic–attending South African women reporting 5 or more lifetime sex partners.[38] Because of relatively strong gender-based constraints on women's sexual behavior in South Asia, Indian women have little opportunity and great costs associated with sexual risk-taking; thus, their HIV infection is likely to be driven to a greater extent by husbands' behavior (ie, extramarital sexual risk and marital sexual violence). Further, IPV may pose a relatively greater HIV threat to Indian married women based on a lack of communication regarding sex being a culturally prescribed marital norm,[53] posing additional barriers to both discussion of sexual risk and women's resistance to sexual violence. Thus, consideration of cultural and geographic contexts in such investigations is likely critical to advancing understanding of how men's IPV, men's sexual risk, and women's sexual risk interact in relating to HIV infection across populations.

Current evidence of elevated HIV prevalence among abused women holds critical implications for practice. Clinicians should incorporate inquiries to women regarding experiences of partner violence, particularly those working in settings focused on care for STIs,[21] as such infection may be considered a marker for elevated risk of both IPV and HIV. As important as identifying abused women, however, is education regarding the nature of their risk and assistance to reduce this risk; thus, greater support for community-based programs supporting women surviving IPV is also required. Further, clinical programs addressing STI/HIV among men should include a focus on IPV as a potential transmission risk for their female partners. However, what will likely be critical to the ability of such programs to reduce men's risk of transmission is the modification of gender norms that have been described as supporting both sexual risk and IPV.[33]

Current findings should be interpreted in the light of several notable design limitations. Analyses are cross-sectional in nature; thus, causality and ordering of events is uncertain. However, because of the lack of prior knowledge of HIV status, it is unlikely that having been found HIV positive precipitated abuse of women from husbands. It is possible that men's elevated risk behaviors found to be associated with IPV perpetration are responsible for the observed associations between IPV and HIV infection among Indian women. Future studies of women's HIV infection should involve models inclusive of both men's and women's sexual risk behavior and men's HIV status.

The relatively low prevalence (0.22%) of HIV in the current sample limited statistical power such that detection of effect estimates smaller than ORs of 2.0 was not supported; given this limitation, further work among representative samples of higher HIV prevalence is recommended to clarify the present findings. The IPV assessment within the NFHS-3 was limited to 8 items. Although this assessment was designed for feasibility and consistency across nations in assessing violence against women from male partners, it may represent an underestimate of the full range of IPV-related experiences, particularly forms of violence specific to the Indian context. However, the currently observed IPV prevalence of 35% is comparable with that found in multiple studies across other countries.[54] Social desirability issues may have led women to underestimate their number of lifetime sexual partners; however, current results are consistent with low levels of extramarital and lifetime sexual partnerships previously reported among South Asian women in both high-risk[8] and population-based samples.[55] Finally, available measures of women's sexual risk did not include additional predictors of HIV (eg, injection drug use and involvement in sex trade). Inclusion of a more comprehensive assessment of women's risk may result in greater precision in models explaining HIV infection based on such behavior, and such broader assessments of women's behavior should be included in future investigations to clarify present findings.

Findings of the current study verify the results of earlier examinations conducted across South Asia and Africa, bolstering the increasing calls for con-

sideration of women's experiences of partner violence[18,27,38] and men's perpetration of partner violence[21-24] in efforts to prevent heterosexual transmission of HIV, both in India and across the globe. Recent efforts aimed at reducing HIV risk via reducing IPV among women should be carefully studied for broad implementation and adaptation for multiple national contexts. Perhaps more importantly, innovative efforts to work with men to change gender norms that promote both abusive and HIV risk behaviors,[33] if proven effective, hold exciting promise for both reduction of HIV infection among men and subsequent infection of women who are the partners of such men. Thus far, major global initiatives to prevent HIV have not sufficiently recognized the potential of such programs to alter this critical element in the spread of HIV.

SUMMARY

Married Indian women who experience physical and sexual violence from husbands face a significantly increased risk of HIV infection as compared with women who are not thus abused, and this increased prevalence of infection is not affected by major risk behaviors within their control. Findings of the present study, based on both the large population-based sample and the use of standard diagnostic testing for HIV infection, should serve to confirm the nature of this relationship and move public health policy-makers and practitioners to increase recognition of IPV as a critically important target in the global fight against HIV/AIDS.

Author Contributions: Dr Decker had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Silverman, Decker, Saggurti, Balaiah, Raj.
Acquisition of data: Decker.
Analysis and interpretation of data: Silverman, Decker.
Drafting of the manuscript: Silverman, Decker.
Critical revision of the manuscript for important intellectual content: Silverman, Saggurti, Balaiah, Raj.
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REFERENCES

1. 2007 AIDS Epidemic Update. Joint United Nations Programme on HIV/AIDS and World Health Organization. http://data.unaids.org/pub/EPISlides/2007/2007_epiupdate_en.pdf. Accessed July 15, 2008.
2. Report on the Global AIDS Epidemic. Joint United Nations Programme on HIV/AIDS and World Health Organization. http://www.unaids.org/en/KnowledgeCentre/HIVData/GlobalReport/2006/. Accessed July 15, 2008.
3. Nepal country profile. Joint United Nations Programme on HIV/AIDS. http://data.unaids.org/pub/Report/2008/nepal_2008_country_progress_report_en.pdf. Accessed July 18, 2008.
4. India country profile. Joint United Nations Programme on HIV/AIDS. http://data.unaids.org/pub/Report/2006/2006_country_progress_report_india_en.pdf. Accessed July 18, 2008.
5. India National Family Health Survey (NFHS-3) 2005-2006. International Institute for Population Sciences (IIPS) and Macro International Inc. http://www.nfhsindia.org/nfhs3.html. Accessed July 15, 2008.
6. HIV/AIDS in India. World Bank. http://siteresources.worldbank.org/INTSAREGTOPHIVAIDS/Resources/HIV-AIDS-brief-Aug07-IN.pdf. Accessed July 18, 2008.
7. Gangakhedkar RR, Bentley ME, Divekar AD, et al. Spread of HIV infection in married monogamous women in India. *JAMA*. 1997;278(23):2090-2092.
8. Mehta SH, Gupta A, Sahay S, et al. High HIV prevalence among a high-risk subgroup of women attending sexually transmitted infection clinics in Pune, India. *J Acquir Immune Defic Syndr*. 2006;41(1):75-80.
9. Newmann S, Sarin P, Kumarasamy N, et al. Marriage, monogamy and HIV: a profile of HIV-infected women in south India. *Int J STD AIDS*. 2000;11(4):250-253.
10. Godbole S, Mehendale S. HIV/AIDS epidemic in India: risk factors, risk behavior, and strategies for prevention and control. *Indian J Med Res*. 2005;121(4):356-368.
11. Bates LM, Schuler SR, Islam F, Islam MK. Socioeconomic factors and processes associated with domestic violence in rural Bangladesh. *Int Fam Plan Perspect*. 2004;30(4):190-199.
12. Bhuiya A, Sharmin T, Hanifi SMA. Nature of domestic violence against women in a rural area of Bangladesh: implication for preventive interventions. *J Health Popul Nutr*. 2003;21(1):48-54.
13. Naved RT, Azim S, Bhuiya A, Persson LA. Physical violence by husbands: magnitude, disclosure and help-seeking behavior of women in Bangladesh. *Soc Sci Med*. 2006;62(12):2917-2929.
14. Koenig MA, Ahmed S, Hossain MB, Khorshed Alam Mozumder AB. Women's status and domestic violence in rural Bangladesh: individual and community-level effects. *Demography*. 2003;40(2):269-288.
15. Koenig MA, Stephenson R, Ahmed S, Jejeebhoy SJ, Campbell J. Individual and contextual determinants of domestic violence in North India. *Am J Public Health*. 2006;96(1):132-138.
16. Krishnan S. Gender, caste, and economic inequalities and marital violence in rural South India. *Health Care Women Int*. 2005;26(1):87-99.
17. Kumar S, Jeyaseelan L, Suresh S, Ahuja RC. Domestic violence and its mental health correlates in Indian women. *Br J Psychiatry*. 2005;187:62-67.
18. Stephenson R. Human immunodeficiency virus and domestic violence: the sleeping giants of Indian health? *Indian J Med Sci*. 2007;61(5):251-252.
19. el-Bassel N, Fontdevila J, Gilbert L, Voisin D, Richman BL, Pitchell P. HIV risks of men in methadone maintenance treatment programs who abuse their intimate partners: a forgotten issue. *J Subst Abuse*. 2001;13(1-2):29-43.
20. Peedicayil A, Sadowski LS, Jeyaseelan L, et al. Spousal physical violence against women during pregnancy. *BJOG*. 2004;111(7):682-687.
21. Martin SL, Kilgallen B, Tsui AO, Maitra K, Singh KK, Kupper LL. Sexual behaviors and reproductive health outcomes: associations with wife abuse in India. *JAMA*. 1999;282(20):1967-1972.
22. Raj A, Santana C, La Marche A, Amaro H, Cranston K, Silverman JG. Perpetration of partner violence associated with sexual risk behaviors among young adult men. *Am J Public Health*. 2006;96(10):1873-1878.
23. Dunkle KL, Jewkes RK, Nduna M, et al. Perpetration of partner violence and HIV risk behaviour among young men in the rural Eastern Cape, South Africa. *AIDS*. 2006;20(16):2107-2114.
24. Silverman JG, Decker MR, Kapur NA, Gupta J, Raj A. Violence against wives, sexual risk and sexually transmitted infection among Bangladeshi men. *Sex Transm Infect*. 2007;83(3):211-215.
25. Schensul SL, Mekki-Berrada A, Nastasi BK, Singh R, Burleson JA, Bojko M. Men's extramarital sex, marital relationships and sexual risk in urban poor communities in India. *J Urban Health*. 2006;83(4):614-624.
26. Gilbert L, El-Bassel N, Wu E, Chang M. Intimate partner violence and HIV risks: a longitudinal study of men on methadone. *J Urban Health*. 2007;84(5):667-680.
27. Decker MR, Miller E, Kapur NA, Gupta J, Raj A, Silverman JG. Intimate partner violence and sexually transmitted disease symptoms in a national sample of married Bangladeshi women. *Int J Gynaecol Obstet*. 2008;100(1):18-23.
28. Decker MR, Silverman JG, Raj A. Dating violence and sexually transmitted disease/HIV testing and diagnosis among adolescent females. *Pediatrics*. 2005;116(2):e272-e276.
29. Patel V, Weiss HA, Mabey D, et al. The burden and determinants of reproductive tract infections in India: a population based study of women in Goa, India. *Sex Transm Infect*. 2006;82(3):243-249.
30. Wingood GM, DiClemente RJ, Raj A. Adverse consequences of intimate partner abuse among women in non-urban domestic violence shelters. *Am J Prev Med*. 2000;19(4):270-275.
31. Go VF, Sethulakshmi CJ, Bentley ME, et al. When HIV-prevention messages and gender norms clash: the impact of domestic violence on women's HIV risk in the slums of Chennai, India. *AIDS Behav*. 2003;7(3):263-272.
32. Martin SL, Curtis S. Gender-based violence and HIV/AIDS: recognising links and acting on evidence. *Lancet*. 2004;363(9419):1410-1411.
33. Dunkle KL, Jewkes R. Effective HIV prevention requires gender-transformative work with men. *Sex Transm Infect*. 2007;83(3):173-174.
34. Violence against women and HIV/AIDS: critical intersections: intimate partner violence and HIV/AIDS. World Health Organization. http://www.who.int/gender/violence/en/vawinformationbrief.pdf. Accessed July 18, 2008.
35. Chandrasekaran V, Krupp K, George R, Madhivanan P. Determinants of domestic violence among women attending an human immunodeficiency virus voluntary counseling and testing center in Bangalore, India. *Indian J Med Sci*. 2007;61(5):253-262.
36. Fonck K, Leye E, Kidula N, Ndinya-Achola J, Temmerman M. Increased risk of HIV in women experiencing physical partner violence in Nairobi, Kenya [published correction appears in *AIDS*

Behav. 2007;11(2):337]. *AIDS Behav*. 2005;9(3):335-339.
37. Chatterjee N, Hosain GM. Perceptions of risk and behaviour change for prevention of HIV among married women in Mumbai, India. *J Health Popul Nutr*. 2006;24(1):81-88.
38. Dunkle KL, Jewkes RK, Brown HC, Gray GE, McIntryre JA, Harlow SD. Gender-based violence, relationship power, and risk of HIV infection in women attending antenatal clinics in South Africa. *Lancet*. 2004;363(9419):1415-1421.
39. Purwar MB, Jeyaseelan L, Varhadpande U, Motghare V, Pimplakute S. Survey of physical abuse during pregnancy GMCH, Nagpur, India. *J Obstet Gynaecol Res*. 1999;25(3):165-171.
40. Straus MA, Hamby SL, Boney-McCoy S, Sugarman DB. The revised Conflict Tactics Scales (CTS2). *J Fam Issues*. 1996;17(3):283-316.
41. Putting women first: ethical and safety recommendations for research on domestic violence against women. World Health Organization. http://www.who.int/gender/violence/womenfirtseng.pdf. Accessed July 18, 2008.
42. Guidelines for measuring national HIV prevalence in population-based surveys. World Health Organization (WHO) and Joint United Nations Programme on HIV/AIDS (UNAIDS). http://data.unaids.org/pub/Manual/2005/20050101_GS_GuideMeasuringPopulation_en.pdf. Accessed July 18, 2008.
43. Zhang J, Yu F. What's the relative risk? *JAMA*. 1998;280(19):1690-1691.
44. StataCorp. *Stata Statistical Software: Release 9*. College Station, TX: StataCorp LP; 2005.
45. Slaughter L, Brown CR, Crowley S, Peck R. Patterns of genital injury in female sexual assault victims. *Am J Obstet Gynecol*. 1997;176(3):609-616.
46. Dworkin SL, Ehrhardt AA. Going beyond "ABC" to include "GEM": critical reflections on progress in the HIV/AIDS epidemic. *Am J Public Health*. 2007;97(1):13-18.
47. Quinn TC, Overbaugh J. HIV/AIDS in women: an expanding epidemic. *Science*. 2005;308(5728):1582-1583.
48. Wingood GM. Feminization of the HIV epidemic in the United States: major research findings and future research needs. *J Urban Health*. 2003;80(4)(suppl 3):iii67-iii76.
49. Dunkle KL, Jewkes R, Nduna M, et al. Transactional sex with casual and main partners among young South African men in the rural Eastern Cape: prevalence, predictors, and associations with gender-based violence. *Soc Sci Med*. 2007;65(6):1235-1248.
50. Jewkes R, Dunkle K, Koss MP, et al. Rape perpetration by young, rural South African men: prevalence, patterns and risk factors. *Soc Sci Med*. 2006;63(11):2949-2961.
51. Raj A, Reed E, Miller E, Decker MR, Rothman EF, Silverman JG. Contexts of condom use and non-condom use among young adolescent male perpetrators of dating violence. *AIDS Care*. 2007;19(8):970-973.
52. Jewkes R, Dunkle K, Nduna M, et al. Factors associated with HIV sero-status in young rural South African women: connections between intimate partner violence and HIV. *Int J Epidemiol*. 2006;35(6):1461-1468.
53. Sivaram S, Johnson S, Bentley ME, et al. Sexual health promotion in Chennai, India: key role of communication among social networks. *Health Promot Int*. 2005;20(4):327-333.
54. Garcia-Moreno C, Jansen HA, Ellsberg M, Heise L, Watts CH. Prevalence of intimate partner violence: findings from the WHO multi-country study on women's health and domestic violence. *Lancet*. 2006;368(9543):1260-1269.
55. Mercer A, Khanam R, Gurley E, Azim T. Sexual risk behavior of married men and women in Bangladesh associated with husbands' work migration and living apart. *Sex Transm Dis*. 2007;34(5):265-273.

The capacity to be puzzled is . . . the premise of all creation, be it in art or in science.
—Erich Fromm (1900-1980)

