WORKING PAPER
September, 2013

Intimate Partner Violence and Symptoms of Reproductive Tract Infections: Are Indian Women of Low Socio-Economic Status at Increased Risk

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ABSTRACT

Empirical evidence reveals that women who experience intimate partner violence (IPV) are at higher risk of reproductive tract infections (RTIs). Little research exists on potential subgroups of abused women who are uniquely vulnerable to RTIs. This paper assessed whether socio-economic status (SES) mediates the association between physical and/or sexual IPV and self-reported symptoms of RTIs. A cross-sectional investigation was conducted on 65,610 married Indian women sampled via the 2005–06 Indian National Family Health Survey-3. Results showed that 32.0% of the sample ever experienced IPV, and 9.6% reported at least one RTI symptom. While women who experienced IPV are at higher risk of RTI symptoms, we found no evidence that the additional experience of low SES exacerbates women's risk of RTI symptoms. Our findings verified the need for medical providers to incorporate IPV screening and referral for support services into women's healthcare visits. Further research is needed to identify potentially vulnerable subgroups of abused women

INTRODUCTION

Intimate partner violence (IPV) is the most common form of violence against women [1]. According to a recent WHO global systematic review, 30.0% (95% confidence interval (CI): 27.8%-32.2%) of all ever-partnered women ages 15 to 69 have experienced physical and/or sexual violence by an intimate partner in their lifetimes [2]. IPV is an increasingly recognized global problem that in addition to violating women's rights, contributes to a range of negative mental, physical, sexual, and reproductive health outcomes [2-8]. The most prevalent and long-lasting physical consequence of IPV are reproductive tract infections (RTIs) and their symptoms such as vaginal discharge, vaginal sore, chronic pelvic pain, or pain during intercourse [3]. There is a growing body of literature that confirms the link between RTIs and IPV across many different countries, including India [6, 9-16]. However, what remains unknown is how socio-economic status (SES) shapes the association between IPV and RTIs. Population based data from India are used to examine if and how SES mediates the association between physical and/or sexual IPV, and two symptoms of RTIs (abnormal genital discharge and genital ulcer) among married Indian women age 15-49. We hypothesize that women who experience intimate partner violence and are *also* of low SES are uniquely disadvantaged when it comes to their risk of RTI symptoms.

BACKGROUND

In order to examine how SES mediates the association between IPV and RTIs, we must first look to the literature and address evidence of significant links between each of these three topics. The following paragraphs begin with an overlook of RTIs in India, then discuss the relationship between RTIs and IPV, the relationship between RTIs and SES, the relationship

between IPV and SES, and review the sparse literature that has examined specifically how the interaction between IPV and SES is associated with RTIs. The last paragraph discusses the motivation behind this analysis, including our proposed hypothesis of the findings.

RTIs in India

One estimate of the prevalence of reproductive tract infections among Indian women comes from a population-based study conducted in Goa [15]; Patel et al. (2006) reported that 28.3% of 2,494 women ages 18 to 45 were medically diagnosed with RTIs. Reproductive tract infection is a generic term used to describe three types of infections: sexually transmitted infections (STIs), endogenous vaginal infections, and iatrogenic infections due to medical procedures [17]. This analysis considered two symptoms of RTIs: 1) abnormal genital discharge, which is a symptom of all three types of RTI infections, and 2) genital sore, which is considered a symptom of STIs such as genital herpes, or can be the result of genital trauma. Negative health consequences of women's RTIs include enhanced HIV transmission, infertility, ectopic pregnancy, and pelvic inflammatory disease [17].

RTIs and IPV

Past literature sheds light on the generally positive relationship between IPV and RTIs and their symptoms across the world [1, 3, 6, 12, 13, 18-27], and in South Asia [6, 9-11, 14-16, 28]. WHO's multi-country study on women's health and domestic health found that women with a lifetime experience of physical and/or sexual IPV had 1.8 times (95% CI: 1.6-2.0) higher odds of reporting genital discharge than women with no reported experience of IPV [6]. Two cross-sectional studies from Bangladesh showed that IPV was associated with RTI symptoms of vaginal itching or irritation with discharge, and odor with discharge; however, other symptoms including genital sore was not significantly related to physical and/or sexual IPV [9, 28]. A

handful of geographically diverse studies among Indian women found that women's experience of physical and/or sexual IPV was associated with their clinical diagnosis of bacterial vaginosis, clinical diagnosis of STIs, HIV positive status, and symptoms of RTIs including genital sore, abnormal genital discharge, and pain during intercourse [10, 11, 14-16].

Various causal mechanisms help explain the association between IPV and the three infection groups that make up RTIs (STIs, endogenous vaginal infections, iatrogenic infections). Women who are exposed to IPV are at unique risk of contracting STIs from her husband because husbands who perpetrate IPV are also more likely to engage in risky sexual behaviors such as extramarital sex, and have STIs [29]. However, two studies from Bangladesh showed that abused women's risk of RTIs remained after controlling for husbands' STIs [9, 28]. The use of direct physical force and lack of lubrication can cause genital trauma during forced sex that works to increase risk of STI transmission [3]. Additionally, women may be at risk of STIs from an infected husband because unequal relationship power dynamics limits women's ability to negotiate sex or safer sex practices [13, 30]. There is also a reverse causality argument that women with an STI, say contracted from an extramarital affair or even from her husband, may then be at risk of experiencing IPV. The etiology of endogenous vaginal infections, the most common being bacterial vaginosis (BV), is not completely understood, however the epidemiological profile of BV is similar to that of other STIs [31]. IPV may increase iatrogenic infections due to unsafe medical procedures; women who experience IPV are also more likely to have an induced abortion [1]. While abortion is legal in India, access to safe abortion is limited and unsafe induced abortion may lead to infection [17, 32]. Lastly, poor mental health may work to mediate the link between IPV and RTIs symptoms since RTIs are associated with both IPV and abnormal genital discharge [33-36]. Studies show that severe psychological distress,

possibly resulting from IPV, may cause increased somatic symptoms including abnormal genital discharge [34].

RTIs and SES

Based upon published literature, the link between RTIs and SES is unclear after controlling for intimate partner violence; however, generally low SES has been associated with adverse risky sexual behaviors and STIs [37, 38]. Five studies from India have shown differing effects of SES on RTIs. Across various forms of household asset index scores, there is evidence that the poorest women are independently at increased risk of RTIs and their symptoms [10, 11, 14, 39]. After controlling for other factors such as age, wealth, and resident type, the literature found that women's achieved education level is not significantly linked to RTIs or RTI symptoms. However, illiterate women were found to be at an increased risk of STI, but not an endogenous infection [10, 11, 14, 15]. Two Indian studies that measured RTI via clinical diagnosis found that no tap water in the home places women at 50% to 100% higher odds of also having an STI [15, 16].

Causal pathways exploring the possible link between SES and RTIs are similar to those mechanisms between IPV and RTIs because many are related to women's empowerment and relationship equity. Illiterate women and women of low health status will likely have limited status in their marriage to negotiate sex or safer sex practices that prevent STI transmission [13]. The literature finds that Indian men of low SES are more likely to have an STI; due to generally assortative marriage in India by SES, women of low SES are turn at higher risk of being infected with an STI from her husband than women of higher SES [40]. Additionally, women of low SES maybe less likely to seek treatment for an RTI and therefore will suffer with RTI symptoms for longer than women of higher SES. As a result, at any given cross-sectional time of a survey,

women of low SES will be more likely to have an RTI symptom, even if the incidence rate is the same for all women regardless of SES.

IPV and SES

Although SES is not a direct causal factor of IPV, women from low SES groups may be indirectly at an increased risk of domestic violence. IPV undoubtedly exists among higher socioeconomic groups, but may be more prevalent in low SES groups due to increased daily and lifetime stresses. A variety of household asset index scores that use different indicators have been developed to assess IPV and SES in India, and a consistent pattern in the literature indicates that higher asset index scores are protective of IPV [29, 41-43]. For example, the WorldSAFE consortium 1997 – 2003 population-based surveys in three Indian urban communities (Lucknow, Trivandrum, Velore) constructed a family asset index based on a synthetic principal components analysis of 13 indicators, and found women with a higher asset index score were less likely to experience physical violence in the past 12 months [41]. Kimuna et al. (2013) determined risk factors of physical and sexual IPV among a population-based sample of Indian women using a multivariate logistic regression analysis. The results showed that women in the poorest wealth quintile were at an increased risk of physical IPV as compared to women in the top three quintiles and were at increased risk of sexual IPV as compared to women in the top two quintiles [42]. Several studies have examined individual indicators for wealth, such as number of appliances in the household and the location of the toilet facility, and found the same protective pattern [44]. IPV may disproportionately affect poorest women because they are more likely to experience stress associated with poverty, such as shortages of consumption goods, cramped physical living space, and full responsibility for house maintenance and childcare. Known risk factors of IPV include marital conflict and economic stress [45]. The negative relationship

between wealth and IPV may also be partially due to measurement problems, because women of higher SES may be more likely to under-report marital violence due to the negative social stigma of IPV.

While the literature finds that educated women are at lower risk of IPV than non-educated women, the relationship between IPV and education is less consistent than the relationship between IPV and various household asset index scores [41, 42, 44, 46, 47]. According to the WorldSAFE study conducted between 1997 and 2003 in three urban areas of India, the IndiaSAFE study conducted between 1998 and 1999 in seven study sites, and the NFHS-3 survey collected between 2005 and 2006, women's higher education decreases the risk of experiencing physical violence [41, 42, 44]. However, a Kerala-based 2001 household survey of 502 married women found that education was not a significant predictor of physical IPV [46]. Additionally, while Kimuna et al. (2013) found that among a population-based sample of Indian women, those with more than secondary education were at lower risk of physical IPV as compared to women with no education, there was no consistent relationship between education and sexual IPV. It is generally believed that lower education levels are an indicator of poor communication skills and leave women without the skills to resolve conflicts through discussion-driven approach [48]. Conversely, women with higher education may have knowledge of their own rights under the 2005 Protection of Women from Domestic Violence Act or of community resources they can rely on when confronting abusive situations [49]. The relationship between education and IPV may be partially obscured due to cultural differences across India's states. Jejeebhoy (1998) reported that the protective effect of education of violence was stronger in the more egalitarian society of southern India, specifically, Tamil Nadu, than in northern India, specifically Uttar Pradesh [50].

SES as effect modifier of IPV and RTI

There is a dearth of literature that examines if SES is a significant effect modifier in the relationship between IPV and RTIs. The few studies that address this interaction between IPV and SES as it is related to RTIs are based in conflict areas and Sub-Saharan Africa, or focus on HIV rather than RTIs more broadly [38, 51-53]. We located only one manuscript that specifically analyzed the interaction between IPV and SES on RTI symptoms. This South Asia study examined 4,195 Bangladeshi women, and found that women of low SES were not uniquely disadvantaged when it comes to the effect of IPV on RTI [54]. Specifically, the risk of both genital sore and abnormal genital discharge among women who experienced IPV was higher for not poor and literate women than for poor and illiterate women; although, there was no specific mention of whether these differences between poor and not poor or illiterate and literate women were statistically significant. In their assessment of IPV and SES on RTI symptoms, Rahman et al. (2013) controlled for many important measures such as age, residence, religion, and ever-use of contraception; however, their results may be subject to omitted variable bias because they failed to control for women's report of extra-marital sexual partners.

Motivation

Our analysis examined the relationship between IPV and SES, and explored the role that SES plays in modifying the relationship between IPV and RTIs among a population-based sample of married Indian women. This topic of inquiry is particularly important in India where an estimated 1/3 of ever-married women have experienced physical and/or sexual IPV, and 29.8% of the Indian population lives below the poverty line [2, 55, 56]. We hypothesize that women who experience intimate partner violence and are *also* of low SES are uniquely disadvantaged when it comes to their risk of RTI symptoms. We believe the causal mechanisms

that link IPV to RTIs, and SES to RTIs, will be exacerbated in the presence of low SES and IPV, leading to an increased risk of RTI symptoms. For example, as compared to women of higher SES who experience IPV and women of low SES who do not experience IPV, women of low SES who also experience IPV may be at higher risk of RTIs because their husbands are more likely to have an STI and genital trauma during forced sex increases risk of transmission. As mentioned above, the literature has established that Indian women who experience IPV are at an increased risk of having an RTI. If, as we hypothesize, low SES exacerbates the relationship between IPV and RTI, these findings will recognize vulnerable subgroups of women who are at particular risk of RTIs.

DATA AND METHODS

Data

The present study used the 2005-06 National Family Health Survey-3 (NFHS-3) conducted by the International Institute for Population Sciences (IIPS) under the Ministry of Health and Family Welfare of India from November 2005 to August 2006. The NFHS-3 is India's equivalent of the Demographic and Health Surveys (DHS), and is a public access dataset with no personal identification information on the survey participants. The survey was approved by the Institutional Review Boards of the International Institute for Population Sciences, and the Technical Assistance Unit of ORC Macro International [55]. The sample covered 99% of India's population residing in 109,041 households of its 29 states, and included a total of 124,385 ever-married women (ages 15-49). The IIPS interviewers obtained informed consent from each respondent [55]. IIPS interviewers randomly selected just one woman per sampled household to participate in the gender-based module of the survey in order to maintain confidentiality and

protect the respondents as recommended by the WHO ethical guidelines [57]. Therefore, of the sample of 124,385 ever-married women, only 69,484 ever-married women were also asked the module on gender-based violence. All interviewers were trained on the importance of emphasizing confidentiality and establishing complete privacy so that interviews were stopped when privacy was breached [58]. Our analysis was further limited to 65,610 currently married women, excluding 3,874 currently non-married respondents who were not at risk of IPV by husband at the time of the survey. Table 1 lists the number of missing data values for each measure used in the final analyses; women without complete data on all variables were dropped from the analysis. The final sample size for all analyses of genital sore was 64,536 currently married women ages 15 to 49, and the final sample size for all analyses of abnormal genital discharge was 64,543 currently married women ages 15 to 49.

Measures

Outcomes

The NFHS-3 questionnaire was administered face to face and most variables were assessed via self-report. The women's questionnaire module of the survey specifically included questions on self-reported symptoms of RTIs in the 12 months prior to the survey. Two outcomes were measured: *genital sore* and *abnormal genital discharge*. Specifically, women were asked 'during the last 12 months, have you had a genital sore or ulcer?' And, 'during the last 12 months, have you had a bad smelling abnormal genital discharge?' The two RTI symptom measures are dichotomous, coded as no or don't know=0 (reference), and yes=1.

Exposure variables of interest

The key exposures of interest included experience of *IPV,* and two SES measures - *wealth index,* and *literacy*. The gender-based module of the women's questionnaire included

questions on self-reported experience of intimate partner violence. A woman was considered to have experienced IPV if she reported ever suffering one or more of the following acts of physical or sexual violence by her current husband: husband ever pushed, shook, or threw something, slapped, punched with fist or something harmful, kicked or dragged, tried to strangle or burn, attacked her with a knife or weapon, or ever physically forced sex or other sexual acts when not wanted. Socio-economic status was assessed using two measures: *wealth index* and *literacy*. The *wealth index* measure was derived from questions concerning household assets on a variety of consumer items such as televisions, refrigerator, mobile phone, or bicycle, and also on dwelling characteristics such as drinking water, sanitation facilities, and construction materials. Principal component analysis was used to generate a weight for each asset, and the resulting asset scores were standardized with a mean of 0 and standard deviation of 1 [59]. Women within each household were assigned a score based on the sum of asset weights, then the individual household wealth scores were grouped by quintiles where 1=poorest, 2=poorer, 3=middle, 4=richer, and 5=richest 20% of households. The *literacy* measure was assessed with two question items and categorized into a dichotomous variable. Women were considered literate if they attended secondary education or higher, or if they attended primary school and could read a whole sentence. Conversely, women who reported no education or attended primary education but who could not read a whole sentence were coded as illiterate.

Control Variables

The survey also included many other questions related to demographic factors, children, decision-making ability, justification of wife beating, etc. Although a number of potential control variables were initially considered for the analysis, variables such as spousal age difference, decision-making index, and wife beating justification index were excluded from the final model

due to the lack of association with the RTI symptoms and IPV in a preliminary analysis. The final control variables selected for the present study were: *age, residence, region, religion, ever-use of contraception, parity, desire for more children, extra-marital sexual partners*, and *husband's education*. The following two paragraphs will discuss how each control variable was measured broken down by demographic controls and behavioral controls.

Demographic control variables: *Age* was self-reported by the respondent and measured as a continuous variable. *Region* (northeast (reference), north, east, central, west, or south) and *residence* (urban (reference), rural) were based on the state in which the household of the respondent was located and whether the cluster that contained the household was defined as urban or rural. *Religion* was categorized into three levels based on self-report identification: Hindu (reference), Muslim, and other, which included other known religions in addition to responses of 'don't know' and 'no religion'. Education of the respondent's current husband was reported by the respondent and categorized into four levels including no education (reference), primary education only, secondary education, or higher than secondary education.

Behavioral control variables: In the NFHS-3 survey, women who reported knowing about a method of contraception were then asked about their use of the method, including whether they had ever used the method. The *ever-use of contraception* measure was created as a categorical measure with four mutually exclusive levels defined as: never used a method (reference), ever used a condom, ever used another modern method but never a condom, or ever used a traditional method but not a modern method. *Parity*, or number of total children ever born, was created as a categorical measure with four levels: no children (reference), 1 child born, 2 to 4 children born, and five or more children born. The *desire for more children* measure was based on the following question asked of non-pregnant women: 'would you like to have (a/another) child or

would you prefer not to have any (more) children?' All women practicing female or male sterilization, infecund women, women who did not want (more) children, and women who wanted children but not within the next two years were categorized as did not desire more children (reference). Conversely, women who were undecided, wanted children within two years, or wanted children but unsure of timing were coded as desired more children. Respondents were asked how many extramarital sexual partners the respondent had in the prior 12 months; the variable *extramarital sexual partners* was coded as at least one partner, and no other partners (reference).

Data Analysis

Logistic regression models were fit to each of the two outcomes, genital sore and abnormal genital discharge. The models were fit initially by controlling for factors shown to be associated with the specific outcomes in previous studies, and eventually limited to only those variables that within a full model with all possible control variables, either altered crude point estimates more than 10% or were significant predictors at alpha = 0.10. Three models were run for each outcome:

Model 1: $\text{logit}(p) = \beta_0 + \beta_1 \text{IPV} + \beta_2 \text{wealthindex} + \beta_3 \text{literacy} + \beta_x \text{controlvariables}$

Model 2: $\text{logit}(p) = \beta_0 + \beta_1 \text{IPV} + \beta_2 \text{wealthindex} + \beta_3 \text{literacy} + \beta_4 \text{IPV} \times \text{wealthindex} + \beta_x \text{controlvariables}$

Model 3: $\text{logit}(p) = \beta_0 + \beta_1 \text{IPV} + \beta_2 \text{wealthindex} + \beta_3 \text{literacy} + \beta_5 \text{IPV} \times \text{literacy} + \beta_x \text{controlvariables}$,

where $\text{logit}(p)$ is the log odds of the probability of each outcome, β_0 is a constant, β_1, β_2, and β_3 are the main effects of IPV, wealth index, and literacy respectively, β_4 is the interaction effect of IPV and wealth index, β_5 is the interaction effect of IPV and literacy, and β_x are the main effects of all control variables.

Model 1 was fit to both genital sore and abnormal genital discharge; it is an additive model that included all three exposure variables of interest (IPV, wealth index, and literacy), as well as the control variables. The results from Model 1 are displayed in Table 3. Model 2 was fit to both genital sore and abnormal genital discharge; it included the main effect terms of IPV and wealth index, an interaction between IPV and wealth index, and controlled for literacy and the other control variables. Model 3 fit to both genital sore and abnormal genital discharge; it included the main effect terms of IPV and literacy, an interaction between IPV and literacy, and controlled for wealth index and the other control variables.

The results from Model 2 for genital sore and abnormal genital discharge are shown in Figures 1 and 3, respectively. The results from the Model 3 for genital sore and abnormal genital discharge are shown in Figures 2 and 4, respectively. The graphs in each figure display the adjusted odds ratio (aOR) and 95% CIs between IPV and RTI symptoms per wealth quintile and literacy level by adding the main effect of IPV to the interaction effect of wealth status, and literacy. The bottom row of numbers in each figure displays the aOR and 95% CIs for each interaction term. By assessing the interaction between IPV and wealth index and IPV and literacy as they are associated with RTI symptoms, we were able to determine if and how SES mediates the association between IPV and RTI symptoms.

Wald tests were utilized to measure the joint effect of the interaction terms β_4 and β_5 in Models 2 and 3 for both RTI symptoms. Regression models were weighted to reflect the complex sampling design of the NFHS-3. All analyses were conducted using Stata Version 11.2 (Macintosh, Stata Corp, College Station, TX).

RESULTS

Among the 65,610 currently married Indian women who participated in the gender-based violence module of the NFHS-3, 1,349 (2.06%) women reported a genital sore, and 5,671 (8.65%) women reported abnormal genital discharge in the past 12 months (Table 1). Thirty-two percent (20,978/65,610) of women reported ever experiencing physical or sexual violence perpetrated by their current husband. Of the 20,978 women who experienced IPV, women in the bottom wealth quintiles were more likely to experience violence compared to women in the other wealth quintiles (p-value<0.001) (Table 2). Exactly 47.65% of women in the poorest quintile reported IPV, whereas 36.70% of women in the middle wealth quintile, and 15.79% of women in the richest wealth quintile reported IPV (Table2). Illiterate women were significantly more likely to experience physical and/or sexual violence by an intimate partner compared to literate women (p-value<0.001) (Table 2).

The results of the logistic regression analyses are displayed in Table 3 and Figures 1 through 4. Table 3 presents the results of the additive model or Model 1 for both genital sore and abnormal genital discharge. After controlling for wealth index, literacy, and a range of demographic and behavioral variables, we find that the odds of having a genital sore among all women who reported experiencing physical and/or sexual IPV was 2.50 (95% CI: 2.12-2.95) times as high as women with no history of IPV (Table 3). Additionally, the odds of having abnormal genital discharge among all women who reported experiencing physical and/or sexual IPV is 2.13 (95% CI: 1.87-2.20) times the odds of having abnormal genital discharge among women who reported never experiencing physical and/or sexual IPV (Table 3).

Figures 1 and 2 display the adjusted odds ratio of reporting a genital sore on experience of IPV per wealth quintile and per literacy level. The first feature to highlight in Figures 1 and 2

is that women who experience IPV are at higher risk of reporting genital sore across all wealth quintiles and literacy levels. Specifically, we find the odds of having a genital sore was 3.37 (95% CI: 2.38-4.79) and 2.93 (95% CI: 2.04-4.22) times as high for women who have experienced IPV as compared to women who have not experienced IPV, among women in the poorest and poorer wealth quintile, respectively (Figure 1). Among women in the third/middle quintile, the odds of a genital sore of women who have experienced IPV were 2.25 times as high compared to women with no history of IPV (95% CI: 1.55-3.26) (Figure 1). For women in the richer and richest wealth quintiles, the odds of genital sore among women who experience violence vs. non-abused women was 1.86 (95% CI: 1.29-2.68) and 2.28 (95%CI: 1.52-3.42) times as high (Figure 1). For illiterate women, the odds of a genital sore among women who have experienced IPV were 2.62 times the odds of having a genital sore among non-abused women (95% CI: 2.09-3.30) (Figure 2). Among literate women, women who experienced IPV have 135% higher odds of having a genital sore than women with no history of violence (95% CI: 1.86-2.98). These findings are expected since the results from the additive model, Table 3, show that after controlling for wealth index and literacy, IPV remains positively associated with RTI symptoms.

The second feature to highlight from Figures 1 and 2 is the risk of genital sore among women who experienced IPV decreases with an increase in wealth quintile, and among literate women. We will begin with wealth quintile by looking at Figure 1. The odds of genital sore among women who experienced IPV compared to women who never experienced IPV is 3.37 among poorest women and then decreases to 2.93 among poorer women, to 2.25 among women in the middle wealth quintile, to 1.86 among richer women, and to 2.28 among richest women. The bottom row of Figure 1 reveals that the odds of genital sore among women who experienced

IPV dropped from 3.37 in the poorest wealth quintile by a magnitude of 0.87, 0.67, 0.55, and 0.68, in the poorer, middle, richer, and richest wealth quintile, respectively (Figure 1)[1]. According to 95% CIs of interaction terms in the bottom row of Figure 1, there is only one statistically significant difference by wealth quintile in the odds of a genital sore among women who experienced IPV compared to women who never experienced IPV, and it is between poorest women and richer women (aOR:0.55; 95%CI: 0.33-0.91). This finding illustrates that the poorest women who also experience IPV are at a unique disadvantage when it comes to genital sore, compared to richer women. However, we find that when all four interaction terms are tested jointly in the model of RTI symptoms on IPV, they are not statistically significant (Wald test statistic=6.60, 4 degrees of freedom, p-value=0.1587) (analysis not shown).

A similar, and non-significant, pattern emerged when assessing the relationship between IPV and genital sore per literacy level. The odds of genital sore among women who experienced IPV compared to women who never experienced IPV decreased from illiterate women to literate women by 10% from 2.62 to 2.35; however it was not a statistically significant difference (95% CI: 0.65-1.24). This is confirmed by the non-significant Wald test (Wald test statistic=0.43, 1 degree of freedom, p-value=0.5109) (analysis not shown).

Figures 3 and 4 display the adjusted odds ratio of reporting abnormal genital discharge on experience of IPV per wealth quintile and per literacy level. Again, the first feature to highlight in Figures 3 and 4 is that women who experience IPV are at higher risk of reporting abnormal genital discharge across all wealth quintiles and literacy levels. Specifically, we find that for

[1] Further explanation to Figure 1: You can multiply the OR of genital sore among women in the poorest wealth quintile who have experienced IPV compared to women in the poorest wealth quintile who have not experienced IPV by the interaction term on poorer women to get the OR of genital sore among women who have experienced IPV and are in the poorer wealth quintile compared to women who have not experienced IPV and are in the poorer wealth quintile => 3.37 * 0.87 = 2.93. Similarly, you can see that 3.37*0.67 = 2.25; 3.37*0.55=1.86; and 3.37*0.68=2.28.

women in the poorest and poorer wealth quintiles, the odds of having abnormal genital discharge among women who experienced physical or sexual IPV was 1.93 (95% CI: 1.65-2.25), and 1.81 (95% CI: 1.52-2.14) times the odds of having abnormal genital discharge among women who never experienced physical or sexual IPV. Among women in the middle wealth quintile, the odds of reporting abnormal genital discharge of women who experienced IPV was 2.29 times as high compared to women who had not experienced IPV in the previous 12 months (95% CI: 1.91-2.74). The odds of abnormal genital discharge among women who experienced IPV was 1.99 and 2.34 times the odds of abnormal genital discharge among women with no experience of IPV, for women in the richer and richest wealth quintiles, respectively. Figure 4 shows that among illiterate women and literate women, the odds of abnormal genital discharge for women with experience of IPV are 1.94 and 2.22 times the odds of abnormal genital discharge for women who never experienced IPV, respectively.

The second feature to highlight from Figures 3, unlike the findings for genital sore, there was no clear pattern of the relationship between abnormal genital discharge and IPV across wealth quintile. The odds of abnormal genital discharge among women who experienced IPV compared to women who never experienced IPV is 1.93 among poorest women and then decreases to 1.81 among poorer women, and increases to 2.29 among women in the middle wealth quintile, to 1.99 among richer women, and to 2.34 among richest women. The bottom row of Figure 3 reveals that the odds of abnormal genital discharge among women who experienced IPV changed from 1.93 in the poorest wealth quintile by a magnitude of 0.94, 1.19, 1.03, and 1.21 in the poorer, middle, richer, and richest wealth quintile, respectively (Figure 3). According to 95% CIs of interaction terms in the bottom row of Figure 3, there is no statistically significant difference in the odds of abnormal genital discharge among women who experienced

IPV compared to women who never experienced IPV, between the poorest wealth quintile and any other wealth quintile. The lack of significance for each interaction was confirmed by the jointly test Wald statistic (W=5.71, 4 degrees of freedom, p-value=0.2222) (analysis not shown).

Additionally, the odds of abnormal genital discharge among women who experienced IPV compared to women who never experienced IPV increased from illiterate women to literate women by 14% from 1.94 to 2.22; however it was not a statistically significant difference (95% CI: 0.96-1.35). This is confirmed by the non-significant Wald test (Wald test statistic=2.36, 1 degree of freedom, p-value=0.1244) (analysis not shown).

DISCUSSION

Results of this population-based survey reveal that almost 1 in 3 married Indian women have experienced physical and/or sexual violence by their current husband. This high prevalence rate is not far from the estimated 38% of South-East Asian women who reported physical or sexual IPV in the *WHO multi-country study on women's health and domestic violence against women* [2]. Our findings add to previous research that has found that non-educated women and women of lower wealth status are more likely to experience IPV [29, 41-44, 46, 47]. Literate women may have better communication skills and increased ability to use information and resources available in society to avoid or escape IPV compared to illiterate women [47]. Additionally, higher wealth status may reduce IPV risk by decreasing marital conflict due to economic stressors associated with poverty, or by allowing women more financial autonomy to avoid or escape IPV [45].

This study also adds to the existing body of literature from South Asia that positively links IPV to women's RTIs and its sequel [9, 11, 14-16, 28]; specifically women's experience of

physical and/or sexual violence places her at higher risk of having abnormal genital discharge or genital sore(s). Salam et al. (2006) conducted a cross-sectional study of 496 currently married women in slums of four urban cities in Bangladesh. Multivariate analysis revealed that women who reported physical, sexual, or psychological IPV were 1.85 times as likely to have RTI symptoms than non-abused women [28]. A second cross-sectional analysis of 2,865 married couples sampled in the Bangladesh Demographic Health Surveys measured seven symptoms of gynecologic morbidity in the past six months [9]. After controlling for demographic characteristics, women with physical IPV alone were 1.34 times as likely to report vaginal itching or irritation and discharge than non-abused women (95% CI 1.04-1.72); and women with sexual IPV alone were 2.08 times as likely to report odor with discharge than non-abused women (95% CI 1.17-3.70). However contrary to this study's findings, Decker et al. found that physical and/or sexual IPV was not significantly associated with genital sore, which is likely due to the addition of husband's STI as a control variable in the multivariate analysis [9]. In 2006, Patel et al. published a cross-sectional study looking at the determinants of RTIs among a population-based sample of 2,949 women in Goa, India [15]. RTI was medically diagnosed using lab specimens, and categorized into three outcomes: any STI, bacterial vaginosis (BV), and candidiasis. After adjusting for important demographic factors, physical and sexual IPV was associated with BV, and sexual IPV was associated with any STI. A cross-sectional analysis of 3,642 couples from Uttar Pradesh in northern India measured husband to wife violence based on men's reports [14]. Multiple regression analysis found that compared to wives whose husbands did not report perpetrating any IPV, wives whose husbands reported sexual IPV alone were 1.42 times as likely to report at least one symptom of gynecologic morbidity (95% CI 1.04-1.75), and wives whose husbands reported both physical and sexual IPV were 1.72 times as likely to report

a symptom of gynecologic morbidity (95% CI 1.05, 2.58) [14]. A 2008 population-based study on a sample of 2,180 women age 18-45 from Goa, India analyzed the association between IPV and STIs [16]. Chlamydia, gonorrhea, or trichomoniasis were detected using a culture kit based on vaginal and/or urine specimens. Findings showed that incident STI was univariately associated with reported ever experience of sexual IPV (OR=3.0; 95% CI 1.2-7.5), but not physical violence (OR=1.4; 956% CI: 0.7-3.0) [16]. This study's findings do not necessarily contradict Weiss et al. findings because this study looked more broadly at symptoms of RTIs, rather than medical diagnoses of three STIs.

Our findings demonstrated that women who sit at the nexus of low SES and IPV are not at an increased risk of genital sores; however, there was a statistically significant difference in the odds of genital sore was between women who experienced IPV in the lowest (poorest) wealth quintile and abused women in the 2nd highest (richer) wealth quintile. Our findings also demonstrated that these same women at the intersection of low SES and IPV were not uniquely disadvantaged when it comes to abnormal genital discharge. The statistically significant difference found in the odds of genital sore between abused women in the poorest and richer wealth quintile, but not found in the odds of genital discharge may be due to differential causes of genital sore and abnormal genital discharge. Genital sore is most often a symptom of STIs, specifically genital herpes, syphilis, or chancroid. As discussed above, previous literature found that IPV increased women's risk of genital sore. Rationale for this finding included: 1) women who experience violence may be less able to negotiate condom use with her partner, 2) sexual violence places women at higher risk of contracting an STI from her infected husband due to lack of lubrication and genital trauma, and 3) husbands who perpetrate violence are more likely to have risky sexual behavior and an STI. Our findings suggest that illiteracy and lower wealth

status further exacerbate these causal mechanisms that increase women's risk of genital sore. For example, the ability to negotiate condom use with a husband may be undermined when women are afraid of violence as retribution and when low SES mediates women's lack of confidence and poor communication skills. Additionally, due to generally SES assortative marriage, women who experience IPV and are of low SES may be more likely to be infected with a STI that causes genital sores because men of low SES are more likely to have an STI and trauma from sexual IPV place women at higher risk of then contracting STIs [40]. This study was unable to control for husband's risky sexual behavior or STI; however, previous studies have shown that the risk of RTIs among abused women remained after controlling for husbands' STIs [9, 28]. Last, women of higher SES who experience IPV may be more likely to seek medical care to treat a genital sore, thereby reducing the given number of higher SES women with a genital sore at any given time and resulting in an increased risk of genital sore among abused and low SES women. In contrast, abnormal genital discharge is a symptom of all three types of RTIs (STIs, endogenous infections, and iatrogenic infections), and as a result this may explain the lack of association between discharge and the interaction terms of IPV and SES status variables. For example, abnormal genital discharge is linked to poor mental health and psychological distress. It is possible that women who experience IPV who are also of higher SES are just as likely to have poor mental health than women who experience IPV of lower SES status, thereby resulting in no increased effect of IPV on genital discharge among poorest women compared to women of higher SES. Additionally, because abnormal genital discharge is harder to self-diagnose than genital sore, the self-report of genital discharge may be biased.

Our findings are somewhat contrary to the findings of Rahman et al. (2013), who utilized the 2007 Bangladesh Demographic and Health Survey dataset to analyze a population-based

sample of 4,195 women. The results of Rahman et al. logistic regression showed that IPV significantly increased all women's risk of genital discharge and genital sore with the exception of illiterate women and poor women whom the risk of genital sore did not significantly increase among women who experienced IPV. Additionally, women of low SES were not uniquely disadvantaged. The risk of both genital sore and abnormal genital discharge among women who experienced IPV was higher for not poor and literate women than for poor and illiterate women, although there was no specific mention of whether these differences between poor and not poor or illiterate and literate women were statistically significant. The inconsistencies between this study's findings and Rahman et al. findings call for further research to fully understand to interaction between SES and IPV as it is linked to RTIs within different country and cultural settings.

There are several limitations of this study to consider in conjunction with the results. First, temporal order could not be determined due to the cross-sectional nature of the current analysis. Second, the study's proxy for RTI was self-reported symptoms of RTIs rather than clinical diagnosis. Based on previous literature, there are low levels of agreement between medically diagnosed symptoms of gynecologic morbidity or RTIs and self-reported symptoms [15, 60, 61]. However, studies that rely on medical diagnosis often utilize a clinic-based population, which reduces the generalizability of the study, whereas self-reported symptoms are advantageous as the findings are generalizable to all married Indian women. Third, the IPV measures also relied on women's report of IPV, and while women are the best informants of their own experiences, it is possible that the assessment tool resulted in incomplete or inaccurate disclosure due to the sensitivity and social stigma associated with domestic violence [1, 19]. Despite these limitations, the present study adds to the existing body of literature by

demonstrating that women in the poorest wealth quintile are a vulnerable subgroup of abused women who are at higher risk of RTIs. Specifically, SES plays in modifying the relationship between IPV and RTIs, and among a population-based sample of married Indian women, those of lowest wealth status who also experience violence are at increased risk of developing genital sores.

TABLES AND FIGURES

Table 1: Distribution of variables, 65,610 currently married women, India NFHS-3 2005-06

		n (%)	mean (sd*)	# missing values
Outcome Variables	**Genital sore in past 12 months**			66
	no	64,195 (97.94)		
	yes	1,349 (2.06)		
	Abnormal genital discharge in past 12 months			59
	no	59,880 (91.35)		
	yes	5,671 (8.65)		
Exposure Variables of Interest	**Ever experienced physical and/or sexual IPV**			19
	no	44,613 (68.02)		
	yes	20,978 (31.98)		
	Wealth Index			0
	poorest	9,054 (13.80)		
	poorer	10,407 (15.86)		
	middle	12,675 (19.32)		
	richer	15,174 (23.13)		
	richest	18,300 (27.89)		
	Literacy			361
	illiterate	31,500 (48.28)		
	literate	33,749 (51.72)		
Demographic and Behavioral Variables	**Respondents' Age**		31.66 (1.97)	0
	Residence			0
	rural	36,778 (56.06)		
	urban	28,832 (43.94)		
	Region			0
	northeast	10,836 (16.52)		
	north	11,933 (18.19)		
	central	11,802 (17.99)		
	east	9,885 (15.07)		
	west	8,541 (13.02)		
	south	12,613 (19.22)		
	Religion			
	hindu	48,863 (74.47)		0
	muslim	8,160 (12.44)		
	other	8,587 (13.09)		
	Husbands' Education			495
	no education	14,614 (22.44)		
	primary	10,190 (15.65)		
	secondary	30,905 (47.46)		
	higher	9,406 (14.45)		
	Ever-Use of Contraception			0
	none	20,797 (31.70)		
	condom	10,997 (16.76)		
	other modern method, but never condom	28,526 (43.48)		
	traditional method, but never modern method	5,290 (8.06)		
	Parity			0
	none	5,745 (8.76)		
	1	28,999 (44.20)		
	2-4	21,399 (32.62)		
	5+	9,467 (14.43)		
	Desires More Children			75
	no	56,065 (85.55)		
	yes	9,470 (14.45)		
	Extramarital Sexual Partners in past 12 months			83
	none	65,465 (99.91)		
	one or more	62 (0.09)		

*sd = standard deviation

Table 2: Bivariate Analysis of IPV and SES indicators, among 65,610 currently married women, India NFHS-3 2005-06

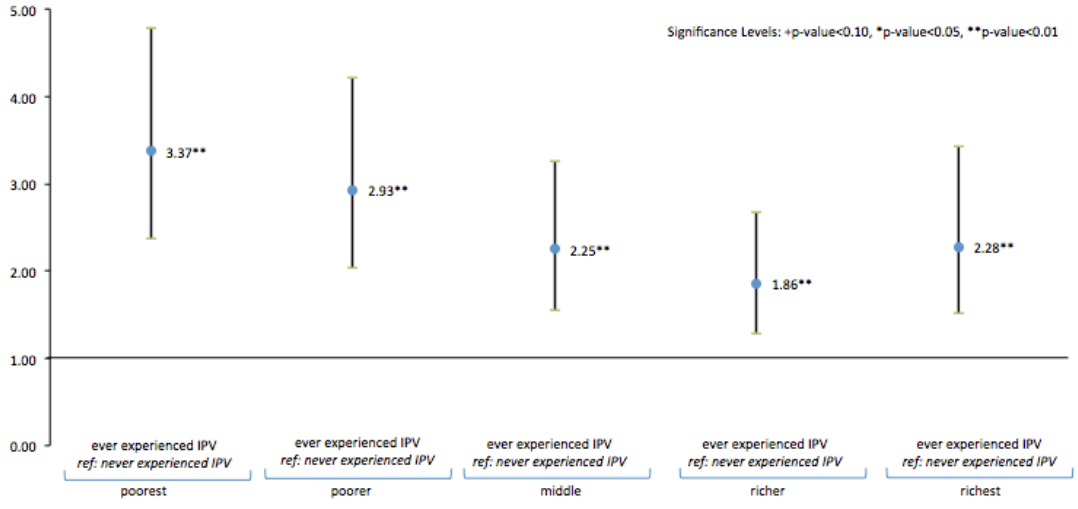
	Never Experienced IPV	Ever Experienced IPV	
	n (row %)	n (row %)	chi-square p-value
Wealth Index			<0.001
poorest	4739 (52.35)	4,314 (47.65)	
poorer	5,927 (56.97)	4,477 (43.03)	
middle	8,021 (63.30)	4,650 (36.70)	
richer	10,521 (69.36)	4,648 (30.64)	
richest	15,405 (84.21)	2,899 (15.79)	
Literacy			<0.001
illiterate	18,166 (57.68)	13,327 (42.32)	
literate	26,202 (77.67)	7,535 (22.33)	

Table 3: Results of Additive Logistic Regression Model #2 of RTI symptoms on IPV, wealth index, and literacy, among 65,610 currently married women, India NFHS-3 2005-06

	Genital Sore[1]	Genital Discharge[1]
	aOR (95% CI)	aOR (95% CI)
Experienced Physical and/or Sexual IPV *(reference: never)*		
ever	2.50 (2.12, 2.95)	2.03 (1.87, 2.2)
Wealth Index *(reference: poorest)*		
poorer	0.77 (0.61, 0.97)	1.06 (0.94, 1.19)
middle	0.81 (0.62, 1.05)	1.05 (0.92, 1.2)
richer	0.72 (0.53, 0.97)	0.93 (0.8, 1.08)
richest	0.77 (0.52, 1.14)	0.98 (0.81, 1.19)
Literacy *(reference: illiterate)*		
literate	1.19 (0.96, 1.47)	0.85 (0.76, 0.94)

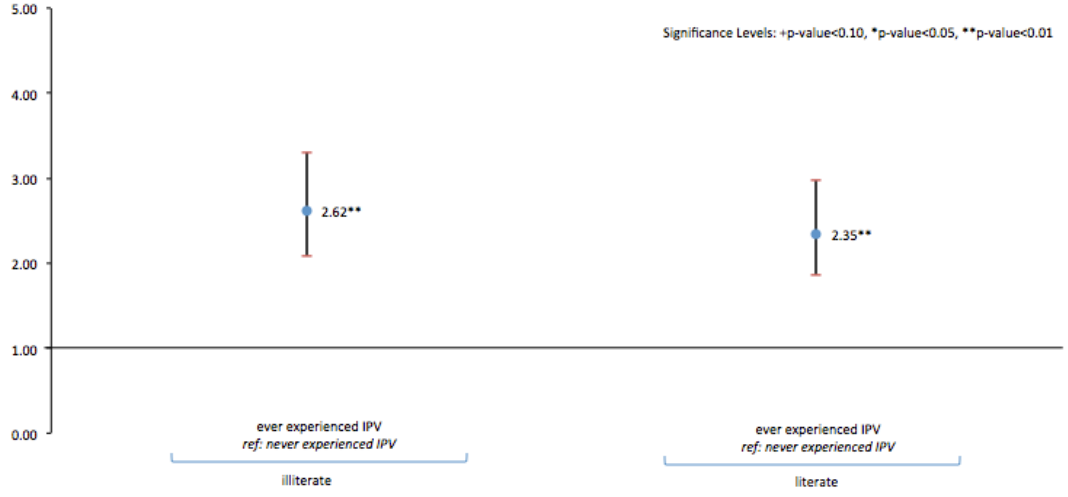
[1.] Adjusted for for age, region, residence, religion, husband's education, ever-use of contraceptives, parity, desires more children, and extramarital sexual partners

Figure 1: **Adjusted odds ratio and 95% confidence intervals of reporting a genital sore in the past 12 on ever experience of physical and/or sexual IPV, per wealth quintile, among 65,610 currently married women, India NFHS-3 2005-06**



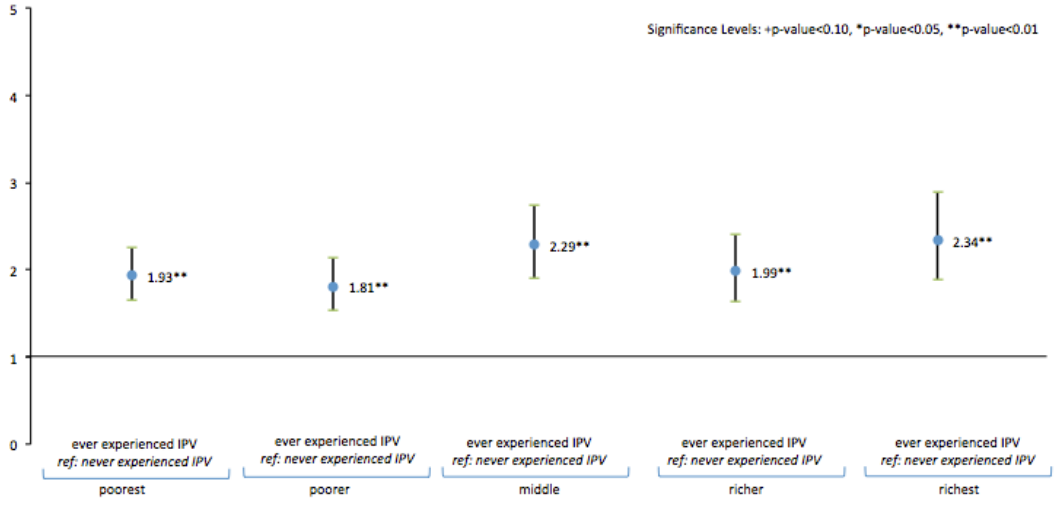
aOR and 95% CI of interaction terms between IPV & wealth index	1.00 *reference*	0.87 (0.52, 1.44)	0.67 (0.4, 1.11)	0.55* (0.33, 0.91)	0.68 (0.4, 1.15)

Figure 2: **Adjusted odds ratio and 95% confidence intervals of reporting a genital sore in the past 12 months on ever experience of physical and/or sexual IPV, per literacy level, among 65,610 currently married women, India NFHS-3 2005-06**



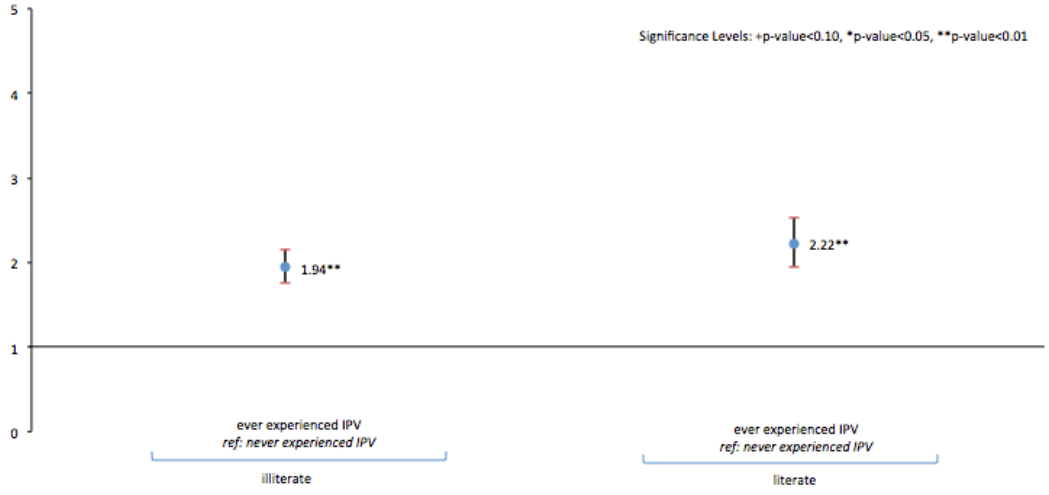
aOR and 95% CI of interaction terms between IPV & literacy	1.00 *reference*	0.90 (0.65, 1.24)

Figure 3: **Adjusted odds ratio and 95% confidence intervals of reporting abnormal genital discharge in the past 12 on ever experience of physical and/or sexual IPV, per wealth quintile, among 65,610 currently married women, India NFHS-3 2005-06**



aOR and 95% CI of interaction terms between IPV & wealth index	1.00 *reference*	0.94 (0.75, 1.18)	1.19 (0.94, 1.51)	1.03 (0.81, 1.32)	1.21 (0.93, 1.58)

Figure 4: **Adjusted odds ratio and 95% confidence intervals of reporting abnormal genital discharge in the past 12 months on ever experience of physical and/or sexual IPV, per literacy level, among 65,610 currently married women, India NFHS-3 2005-06**



aOR and 95% CI of interaction terms between IPV & literacy	1.00 *reference*	1.14 (0.96, 1.35)

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