The effect of gender inequality on couples' HIV risk in North India

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Introduction

Globally, India ranks third in the number of people living with HIV/AIDS followed by South Africa and Nigeria.[1] Men's risky sexual behavior contributes to HIV spread in the country.[2] Premarital and extramarital sex among Indian men are often unprotected, include paid sex, and result in acquisition of other STIs.[3-9] These factors increase Indian men's susceptibility to HIV as well as their partners' risk of infection.[10-14]

International agencies and researchers argue that social determinants such as gender inequality play a critical role in driving HIV spread worldwide.[15, 16] However, the impact of gender-based power on sexual HIV risks in India has not been extensively examined. Research in Africa and America shows that measures of gender-based power such as men's inequitable gender norms and women's low sexual relationship power are associated with high risk sex, infrequent condom use, STI symptoms, and sexual violence.[17-19] In select areas in South and North India, one study found that men's endorsement of inequitable gender norms were associated with HIV risks such as multiple sexual partners, less condom use, poor sexual health, and partner violence.[20] A qualitative study in Chennai, South India showed that gender inequities perpetuate married women's experience of sexual violence from their husbands resulting in their inability to adopt HIV-related preventive behaviors.[21, 22] Given the dearth of work in this area and magnitude of India's HIV epidemic, further research on the relationship between gender-based power and sexual HIV risk behaviors in the subcontinent is critical, particularly among bridging men, who drive the epidemic by spreading the disease to low-risk women.[2] The current study addresses this gap in the literature by investigating the relationship between gender-based power and sexual HIV risk factors using couples-based data from North India.

Study Population

The study site was Uttar Pradesh and Uttaranchal, North India. This region of India has 0.1 million people living with HIV/AIDS and increased disease spread has been detected among bridging men and low-risk women.[1, 24] UP's HIV prevalence is low, but its poor performance on health and social indicators position the state for potentially rapid HIV spread. Since UP is India's most populous state and only five countries in the world are greater in size, a small increase in its HIV infection rate can profoundly affect the national and global epidemic.[25]

The data were collected in 2003 from a probability sample of 3,385 married couples residing in UP and Uttaranchal (the former Hill region of UP). The data are representative of couples living in major urban cities and all rural areas in these states. The study was a part of a larger NIH-funded project that explored the potential for the spread of HIV in central North India. The survey was conducted by the Center of Population Studies at Banaras Hindu University (Varanasi, India) in collaboration with researchers at the

University of North Carolina – Chapel Hill. A multistage cluster sampling design was used to draw the sample of eligible couples. Additional details on the survey's methods are described elsewhere [26]. The study sample included the total analytic sample of these data.

Measures

Sexual HIV risks

Men were asked whether they ever had premarital sex with their current wife or someone else (no=0, yes=1), extramarital sex in the past year (no=0, yes=1), and experienced any STI symptoms, specifically discharge from penis or ulcer, in the past year (no=0, yes=1).

Gender-based power

Gender-based power was measured according to women's autonomy and men's inequitable gender norms. Women's autonomy refers to women's level of interpersonal control. Men's inequitable gender norms describe men's support of attitudes that constrict wives from expressing themselves freely or acting independently. Confirmatory factor modeling was also used to construct both variables.

The men's inequitable gender norms factor consisted of three observed indicators. Men were asked their level of agreement with the statements: (1) there is no harm if a wife sometimes disobeys her husband; (2) a wife should always consult her husband before making decisions, large or small; and (3) there is no harm if a wife goes out alone to a nearby friend/relative's house. The question items were answered on a four-point scale (1=strongly agree, 2=agree, 3=disagree, 4=strongly disagree) but were examined as binary variables (1=strongly agree and agree, 0=strongly disagree and disagree). For items 1 and 3, responses were recoded so that on all items a score of 1 indicated men supported inequitable gender norms and a score of 0 meant they did not.

In the literature, women's autonomy has been operationalized into multiple dimensions and extensively examined with respect to women's reproductive health.[27-30] Dimensions of autonomy examined in this study were (1) women's control over financial resources (5 items), (2) women's decision-making authority (6 items), (3) women's mobility (7 items), and (4) leniency afforded women (5 items). Questions were answered on a three or four point Likert scale. These dimensions were combined in a second-order confirmatory factor model to create a single composite variable measuring women's autonomy. The composite variable preserved the integrity of the individual autonomy dimensions and modeled their inter-relationships. This is important given extensive research indicating the distinct yet potentially correlated features of these dimensions. Further details regarding construction of the second-order women's autonomy factor are discussed elsewhere.[31]

Socio-demographics

Socio-demographic factors included in the study were age, educational level, economic status, area of residence, and region. Age was categorized into four 10-year age groups. Levels of education used were 0 years, up to 8 years, 8 to 12 years, and over 12 years of schooling. The standard of living index created was modeled after that measured by population-based surveys conducted in India known as the Demographic Health Surveys

(DHS). Levels of standard of living were categorized as low, middle, and high based on summed scores and thresholds established in DHS. Type of residence was either urban or rural. Region was divided into five areas: western, central, bundelkhand, eastern, and hill (present day Uttaranchal).

Analysis plan

Wingood and DiClemente's theory of gender, power, and susceptibility to HIV informed our hypotheses that gender inequity is associated with sexual HIV risks among men and women. The authors argue that gender-based power imbalances and unequal gender norms hinder women from protecting themselves from HIV and perpetuate men's risky sexual behavior increasing their own and women's HIV risks.

We tested the effect of men's inequitable gender norms on all sexual HIV risk outcomes. The associations between women's autonomy with their husband's extramarital sex and STI symptoms were examined. The interrelationships among premarital sex, extramarital sex, and STI symptoms were also determined given research in India that shows premarital sex is associated with extramarital sex and that extramarital sex increases likelihood of STI acquisition. Structural equation modeling (SEM) was used to simultaneously assess these relationships in a single model.[23]

SEM followed a two-step process. First confirmatory factor analyses were conducted to construct the two composite factors measuring gender-based power, women's autonomy and men's inequitable gender norms. Since women's autonomy was treated as a second-order factor, we determined if the question items for each dimension loaded well on that dimension and demonstrated adequate model fit. Then the shared covariance of all four dimensions on the second-order autonomy factor was evaluated according to their factor loadings along with model fit. To estimate the men's inequitable gender norms factor, the factor loadings of its observed indicators were examined.

Second, a structural equation model was specified to test the hypothesized relationships. Standardized parameter estimates for all direct and indirect relationships were examined with respect to their relative strength, sign, and statistical significance. Direct effects, which are reported in traditional regression models, are coefficients measuring the association two variables unmediated by any other variables. Indirect effects, which may be estimated using SEM, are the product of all coefficients between two variables with one or more intervening variables.

The default estimation method in most structural equation modeling programs is maximum likelihood. An underlying assumption of this method is multivariate normality of observed variables. However, our data violates this assumption, since all of our observed variables were ordinal or binary. Therefore, parameters were estimated by weighted least squares using robust standard errors and mean- and variance-adjusted chi square test statistics (WLSMV). Previous work has shown WLSMV can be used with categorical outcomes [32]. Missing data were relatively small and list-wise deletion was used.

Three fit indices were used to evaluate model fit: comparative fit index (CFI), Tucker Lewis index (TLI), and the root mean square error of approximation (RMSEA). General standards in the literature indicating adequate model fit are if the CFI and TLI are greater than 0.90 and the RMSEA is less than 0.06 [32]. Analyses were conducted in Mplus version 5.0.

Results

Description of study population

Compared to men in the study sample, a larger percentage of women were younger than 24 and a smaller percentage were 40 or older (Table 1). Over 45% of women versus 22% of men had no education. Over half of couples were in middle standard of living households.

A little over 24%, 7%, and 2% of men reported premarital sex, extramarital sex in the past year, and paid sex in the past year, respectively. Over 30% of men reporting extramarital sex had two or more non-regular sexual partners. Over 70% stated they had not used a condom in their last non-regular sexual encounter. Almost 6% of married men indicated recently experiencing STI symptoms.

As compared to men, a consistently smaller percentage of women said their husbands had engaged in premarital sex (11.9% vs. 24.2%), extramarital sex in the past year (2.9% vs. 7.1%), or ever paid for sex (2.0% vs. 6.1%). On average, almost 80% of men's wives were unaware their husbands had engaged in these sexual behaviors (results not shown)

Between 48% and 83% of men reported an inequitable gender norm. Among men's wives, selected items illustrated variations in women's autonomy by dimension. Women's responses to a decision-making authority question showed that up to 77% participate in buying pots and pans for their homes. A measure of women's control over financial resources indicated that 67% could spend money on small presents. According to a mobility dimension item, 54% of women could go alone to nearby friend or relative's home. While a little over a third of women seldom needed permission to go to the bazaar based on a decision-making authority item.

Confirmatory factor analysis

For the men's inequitable gender norms factor, the standardized factor loadings for the three observed indictors ranged from 0.3 to 0.9 ($p<0.001$) (Table 2). For the women's autonomy second-order factor, the standardized factor loadings of each dimension ranged from 0.5 to 0.8 ($p<0.001$) and the overall model fit was adequate (RMSEA=0.01, CFI=0.97, TLI=0.96). For each dimension, the standardized factor loadings of its respective indictors ranged from 0.4 to 0.9 ($p<0.001$) and demonstrated adequate model fit (results not shown). The confirmatory factor analyses results show that the indicator variables used to construct these gender-based power composite factors adequately captured men's inequitable gender norms and women's autonomy. The second-order factor model results supports grouping question items on women's autonomy by dimension and then estimating the covariation between dimensions rather than lumping all the question items on a single factor.

Multivariate structural equation model

The fit indices of the structural equation model indicated good fit (RMSEA=0.04, CFI=0.95, TLI=0.95). Standardized parameter estimates for effect of socio-demographics on the gender-based power composite variables and outcomes of interest are reported in

Table 3. The associations between measures of gender-based power and sexual HIV risks are reported in Table 4 and shown in Figure 2.

Direct effects of socio-demographics on gender-based power and sexual HIV risks

Men's age, education, and standard of living were not associated with their endorsement of inequitable gender norms (Table 3). Married women between the ages 25-29, 30-39 and over 40 years of age were more likely report autonomy compared to women between the ages 15-24. Women with 8-12 and over 12 years of education were more likely to report autonomy than women with no education.

Older men over 40 years of age were more likely to report premarital sex versus men 15-24 years of age. Men with a medium and high standard of living were also more likely to report premarital sex than men with a low standard of living. Men with 8-12 years of education were more likely to report extramarital sex compared to men with no education. Older men 30-39 years of age were more likely to report STI symptoms in the past year versus men 15-24 years of age.

Direct and indirect effects of gender-based power and sexual HIV risks

The sexual HIV risk factors men's premarital sex, extramarital sex, and STI symptoms were significantly and positively associated with each other. Men stating they had premarital sex were more likely to report extramarital sex in the past year ($B=0.633$, $p<0.001$). Men who had recent extramarital sex were more likely to experience STI symptoms in the past year ($B=0.403$, $p<0.001$) (Table 4, Figure 2).

Men's inequitable gender norms were positively associated with these sexual HIV risks. Men reporting inequitable norms were more likely to report premarital sex ($B=0.136$, $p<0.01$). Men who endorsed inequitable gender attitudes were more likely to report recent extramarital sex, because they were more likely to report premarital sexual behavior ($B=0.080$, $p<0.01$). In addition, men's inequitable gender norms were associated with their recent STI symptoms due to their increased likelihood of reporting both premarital and recent extramarital sex ($B=0.032$, $p<0.01$).

On the other hand, women's autonomy was associated with decreased sexual HIV risks. Women with more autonomy were less likely to have husbands who reported extramarital sex in the past year ($B=-0.122$, $p<0.05$). More autonomous women were also less likely to have husbands who reported recent STI symptoms, given their spouses decreased likelihood of engaging in recent extramarital sex ($B=-0.049$, $p<0.05$).

Table 1: Descriptive statistics on study sample, North India 2003

	Women n=3385 %	Men n=3385 %
Socio-demographics		
Age		
15-24	21.8	8.2
25-29	27.9	21.6
30-39	36.4	39.2
40+	13.9	31.1
Years of education		
0	45.9	22.0
Up to 8	24.6	25.9
8 to 12	17.6	32.2
12+	11.9	20.0
Economic level		
Low	20.8	20.8
Middle	51.9	51.9
High	27.4	27.4
Gender-based power		
Men's inequitable gender norms[1]		
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions	-	58.1
Agree, wife should always consult husband on any decision, large or small	-	82.7
Disagree, there is no harm if a wife goes out alone to go to a nearby friend or relative's home	-	48.1
Women's autonomy[2]		
Control over financial resources: Can spend money on small presents	67.3	-
Mobility: Can go alone to nearby friend or relative's home	54.3	-
Leniency: Seldom needs permission to go to the bazaar	31.9	-
Decision-making authority: Participates in buying pots and pans for the house	77.3	-
Sexual HIV risks		
Premarital sex	11.9	24.2
Extramarital sex in past year	2.9	7.1
No condom use during last extramarital sex in past year	-	71.1[3]
Two or more extramarital partners	-	33.5[3]
Paid sex in past year	-	2.2
Ever paid for sex	2.0	6.1
STI symptoms in past year	-	5.6

[1]reported by men only
[2]reported by men's wives only
[3]among men reporting extramarital sex (n=239)

Table 2: Standardized factor loadings for women's autonomy second-order factor and men's inequitable gender norms first-order factor, North India, 2003

	Factor loadings n=3385
Men's inequitable gender norms (first order factor)[1]	
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions	0.67***
Agree, wife should consult husband on any decision large or small	0.33***
Disagree, there is no harm if a wife goes out alone to go to a nearby friend or relative's house	0.91***
Women's Autonomy (second order factor)[2]	
Control over financial resources (first order factor)	0.80***
Mobility (first order factor)	0.67***
Leniency (first order factor)	0.55***
Decision-making authority (first order factor)	0.51***

*** p<0.001, ** p<0.01, * p<0.05
[1]reported by men
[2]reported by men's wives

Table 3: Standardized coefficients for socio-demographic factors associated with gender-based power and sexual HIV risks among married men and women, North India 2003

	Gender-based power		**Sexual HIV risks**		
	Men's inequitable gender norms[1]	Women's autonomy[2]	Premarital sex	Extramarital sex in past year	STI symptoms in past year
Age					
15-24	Ref	Ref	Ref	Ref	Ref
25-29	0.002	**0.191*** **	-0.024	-0.001	-0.041
30-39	-0.058	**0.306*** **	0.050	0.050	**-0.140***
40+	-0.055	**0.316*** **	**0.094*** **	-0.097	-0.096
Education					
0	Ref	Ref	Ref	Ref	Ref
Up to 8	0.023	0.023	-0.026	-0.051	-0.034
8 to 12	-0.022	**0.089*** **	-0.050	**-0.082***	-0.068
12+	-0.066	**0.149*** **	**-0.121*** **	-0.076	-0.153
Standard of living index					
Low	Ref	Ref	Ref	Ref	Ref
Middle	-0.006	**-0.047***	**-0.126*** **	0.093	-0.005
High	-0.005	-0.011	**-0.183*** **	0.091	0.043

*** p<0.001, ** p<0.01, * p<0.05 ; ns = not significant

[1]reported by men

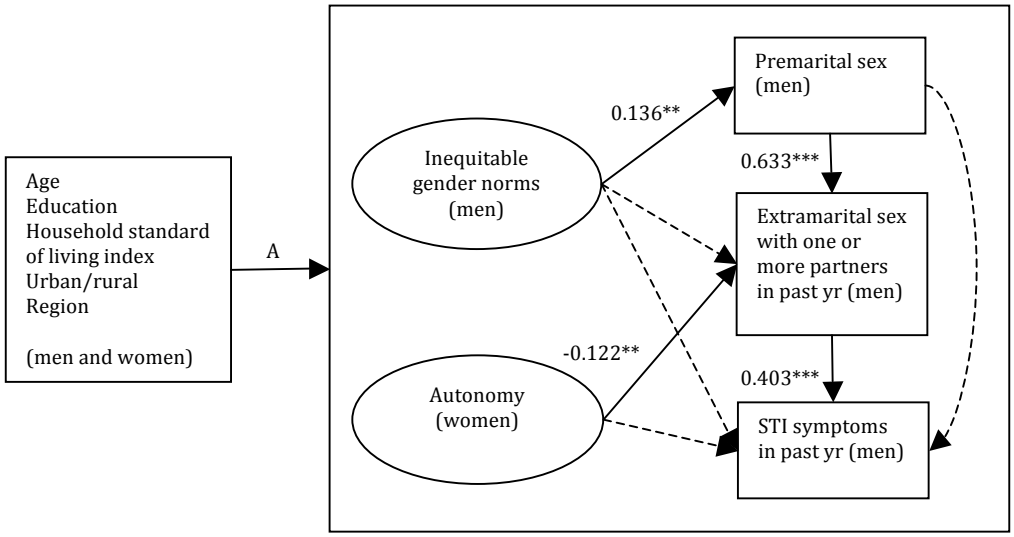
[2]reported by men's wives

Table 4: Standardized coefficients for associations between gender-based power and sexual HIV risks among married men and women, North India 2003

	Sexual HIV risks				
	Premarital sex	Extramarital sex in past year		STI symptoms in past year	
	Direct	Direct	Indirect	Direct	Indirect
Gender-based power					
Men's inequitable gender norms[1]	**0.136****	ns	**0.080****	ns	**0.032****
Women's autonomy[2]	-	**-0.122***	-	ns	**-0.049***
Sexual HIV risks					
Premarital sex	-	**0.633*****	-	ns	**0.235*****
Extramarital sex in past year	-	-	-	**0.403*****	-

*** p<0.001, ** p<0.01, * p<0.05 ; ns = not significant
Note: RMSEA=0.04; CFI=0.95; TLI=0.95
Controlling for age, education, standard of living, area of residence, region
[1]reported by men
[2]reported by men's wives

Figure 2: Diagram of direct effects between gender-based power and sexual HIV risks, North India 2003



A: represents associations tested between each socio-demographic factor and each study variable. Both men's and women's socio-demographics were included and related to the appropriate men's and women's study variables. Parameter estimates for socio-demographic effects shown in Table 3.

Note: *** p<0.001, ** pequal to<0.01, * p<0.05. Dashed lines indicate non-significant effects

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