

Determinants and prevalence of HIV infection in pregnant Peruvian women

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Objectives: To determine age-specific seroprevalence, risk factors, and risk markers for heterosexually-acquired HIV infection among pregnant women.

Design: Cross-sectional study of 12 436 consecutive pregnant women in Lima, Peru in 1996–1997.

Methods: Standardized interviews, serologic tests for HIV and syphilis, bivariate and multivariate analysis.

Results: HIV seropositivity was confirmed in 58 women (0.5%). Only 22.6% were married, and only 12% of HIV infected women reported ≥ 2 sex partners ever. In multivariate analyses HIV infection was associated with: short duration of current relationship; two risk behaviors of women themselves (early onset of sexual activity and number of past sexual relationships); women's perceptions of two risk behaviors of partners (partner is a 'womanizer,' and partner uses illegal drugs); inadequate prenatal care; and four additional risk factors or markers (history of sexually transmitted disease, tuberculosis, or abortion in the women; and diagnosis of HIV/AIDS in a partner).

Conclusions: HIV infection was related both to women's own risk behaviors and to the perceived risk behaviors of their sexual partners. Underlying societal factors related to heterosexual HIV infection, including deferral of marriage, warrant further study.

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Introduction

HIV-1 infection was first detected in Peru in 1983 among men who have sex with men (MSM) [1–3]. A 1995–1996 survey of 500 MSM found 100 (20%) to be HIV seropositive [4]. HIV seroprevalence among female sex workers (FSW) in Lima has ranged from 0.6% [5] to 5.0% [6]. As HIV infection has spread heterosexually in Peru [7], the ratio of men to women with AIDS has decreased from 15:1 in 1990 to 3:1 in 1999 [8].

As elsewhere in Latin America, commercial sex and bisexual behavior occur commonly in Peru [9–11], where injecting drug use remains uncommon, and is therefore unlikely to confound analyses of sexual risk factors for HIV infection among heterosexuals. We conducted this study of pregnant women to define prevalences of and risk factors for heterosexually-acquired HIV infection, to guide development of preventive interventions.

Methods

Study population

This cross-sectional study took place at the Instituto Materno-Perinatal (IMP), which averaged 23 300 deliveries per year from 1991 to 1995, representing 15% of all deliveries occurring in Lima, a city of eight million people. IMP patients generally have low socioeconomic status; 60% receive prenatal care at the IMP.

We included consecutive consenting pregnant women seeking prenatal care, care for abortion (spontaneous, or complications of induced abortion), or undergoing uncomplicated delivery between mid-August 1996 and mid-April 1997. None refused, but some left before the interview. The study enrolled approximately 90% of women making a first prenatal visit, 70% of women with uncomplicated delivery not tested prenatally, and 40% of women with complications of abortion.

Study design

Human subjects review boards of the University of Washington and the Universidad Nacional Mayor de San Marcos approved the research protocol.

Four female interviewers explained the study at the first prenatal visit or within 24 h of hospitalization, obtained written informed consent, and after 10 ml of blood were drawn, administered questionnaires during face-to-face interviews lasting 10–15 min in the prenatal clinic or the postpartum room, and provided the first sexually transmitted disease (STD)/HIV counseling session. Neither interviewers nor participants knew the serologic status of participants at time of interview.

Questionnaire data and HIV test results were linked by code. Clinicians arranged post-test counseling and treatment for HIV infection according to the IMP's current practice.

The questionnaire assessed demographics, reproductive and medical history, sexual behavior of women, and each woman's perception of the sexual behaviors of her male partner(s). Abortion was defined as interruption of pregnancy before 28 weeks' gestation, and 'adequate' prenatal care as three or more prenatal visits during an uncomplicated pregnancy.

Serologies positive for antibody to HIV-1 on duplicate ELISA testing (Ortho Diagnostic Systems, Raritan, New Jersey, USA) were confirmed by Western Blot assay (Organon Teknika HIV-1; Organon Teknika, Durham, North Carolina, USA).

Statistical analyses

Bivariate analyses of associations of HIV seropositivity with potential risk markers and risk factors used chi-square tests for categorical variables, and analysis of variance and t tests for continuous variables. Risk factors for HIV seropositivity were assessed by two-tailed *P* values, odds ratios (OR), and 95% confidence intervals (CI), using Epi-Info (Version 6.02), SPSS for Windows (Version 7), and S Plus 3.3 (DEC-Alpha).

Multivariate analyses used stepwise logistic regression techniques, examining most variables presented in various forms throughout Tables 1 and 2, examining interactions and potential confounding by appropriate interaction terms, and by stratified bivariate analyses. For continuous variables, generalized additive models were used to assess the appropriate functional form in the standard regression model [12].

Results

Of 12 436 pregnant women attending the IMP between mid-August 1996 and mid-April 1997, 5673 (45.6%) were enrolled during prenatal care, 6063 (48.6%) postpartum, and 728 (5.8%) after abortion or stillbirth. Fifty-eight (0.5%) were HIV seropositive and 204 (1.6%) were syphilis seropositive by both Rapid Plasma Reagin (RPR) and *Treponema pallidum* hemagglutination assay (TPHA); 2.5% of women with syphilis versus 0.4% of women without syphilis were HIV seropositive (OR, 5.8; 95% CI, 2.3–14.6). Of 320 women tested twice over an average of 6 months, one underwent HIV seroconversion.

Characteristics of participants associated with HIV seropositivity

The age (\pm SD) of the study population averaged 25.4

Table 1. Risk profiles of pregnant women associated with HIV seropositivity.

	n	HIV+ (%)	OR (95% CI)
Demographic and medical history characteristics			
Marital status			
Married	2806	0.2	1.0
Single	9628	0.5	2.1 (1.0–4.7)
Migration to Lima			
Migrated ≤ 5 years ago	1942	0.2	1.0
Migrated ≥ 5 years ago	4116	0.3	1.7 (0.5–5.0)
Born in Lima	6341	0.6	3.1 (1.1–8.6)
Status at time of interview			
Prenatal care	5673	0.4	1.0
Postpartum	6063	0.4	1.1 (0.6–1.8)
Abortion ^a	728	1.0	2.3 (1.0–5.3)
Women tested postpartum			
≥ 3 prenatal care visits	4126	0.3	1.0
0–2 prenatal care visits	1903	0.8	2.7 (1.3–5.9)
History of abortion ^a			
No	9139	0.3	1.0
Yes	3295	0.8	2.4 (1.5–4.1)
History of STD (excluding syphilis)			
No	12 181	0.4	1.0
Yes	243	2.1	4.8 (1.9–12.1)
History of jaundice			
No	12 009	0.4	1.0
Yes	424	1.2	2.7 (1.1–6.8)
History of tuberculosis			
No	12 056	0.4	1.0
Yes	376	1.9	4.5 (2.0–9.9)
Sexual behavior			
Age at first intercourse			
≥ 18 years	6621	0.3	1.0
< 18 years	5781	0.7	2.4 (1.4–4.1)
Duration of current partnership			
> 3 years	6478	0.3	1.0
≤ 3 years	5146	0.6	1.8 (1.1–3.2)
Anal sex with current partner			
No	8074	0.3	1.0
Yes	3326	0.7	2.1 (1.2–3.6)
Casual partner in the past year			
No	11 737	0.5	1.0
Yes	680	0.6	1.3 (0.5–3.6)
Number of previous sexual relationships prior to current partner			
None	8433	0.3	1.0
One	3541	0.8	3.2 (1.8–5.5)
Two	362	1.1	4.3 (1.5–12.5)
Three or more	75	2.7	10.5 (2.4–45.4)
History of illegal drug use			
No	12 218	0.5	1.0
Yes	94	1.1	2.3 (0.3–16.7)
Alcohol intoxication			
Never	9773	0.4	1.0 ^a
Once to six times per year	2047	0.5	1.3 (0.7–2.6)
At least once per month	592	1.2	2.9 (1.3–6.5)

OR, Odds ratio; CI, confidence interval. ^aIncluded spontaneous, induced, and therapeutic abortion and stillbirth during current pregnancy.

(± 6.6) years. Age-specific HIV seroprevalence was stable at 0.5–0.6% for ages 20–35 years, but dropped to 0.1% for ages > 35 years. Surprisingly, only 22.6% of participants were married, while another 62% cohabited with their current partner. Participants averaged 2.5 pregnancies. HIV infection was significantly more prevalent in unmarried women, women born in

Table 2. Perceived risk profiles of current sex partner associated with HIV seropositivity in pregnant women.

	n	HIV+ (%)	OR (95% CI)
Is a 'womanizer'			
No	8074	0.4	1.0
Yes	1563	1.0	2.9 (1.6–5.3)
Don't know	2079	0.4	1.2 (0.6–2.6)
Had sex with female sex workers			
No	9412	0.4	1.0
Yes	515	1.2	2.8 (1.2–6.5)
Don't know	1789	0.4	1.1 (0.5–2.3)
Has another current partner			
No	10 012	0.4	1.0
Yes	1057	0.6	1.4 (0.6–3.3)
Don't know	647	1.1	2.7 (1.2–6.0)
Likes anal sex			
No	8456	0.4	1.0
Yes	3064	0.6	1.6 (0.9–2.7)
Don't know	196	0.5	1.3 (0.2–9.3)
Has had sex with men			
No	10 499	0.4	1.0
Yes	72	2.8	7.0 (1.7–29.2)
Don't know	1145	0.8	1.9 (0.9–4.0)
Injecting drug user			
No	11 559	0.4	1.0
Yes	8	12.5	32.9 (4.0–272.2)
Don't know	149	2.0	4.7 (1.5–15.3)
Uses other illegal drugs			
No	11 412	0.4	1.0
Yes	169	3.0	7.4 (2.9–18.8)
Don't know	135	1.5	3.6 (0.9–15.1)
Alcohol abuse			
No	8372	0.4	1.0
Yes	3308	0.7	1.7 (1.0–3.0)
Don't know	36	0.0	–
Has been in jail			
No	11 355	0.4	1.0
Yes	231	0.9	1.9 (0.5–8.0)
Don't know	130	0.8	1.7 (0.2–12.5)
Has a history of tuberculosis			
No	11 042	0.4	1.0
Yes	306	1.3	3.2 (1.1–8.9)
Don't know	368	1.1	2.6 (0.9–7.3)
Has a history of sexually transmitted disease			
No	10 448	0.4	1.0
Yes	265	1.9	4.3 (1.7–10.8)
Don't know	990	0.2	0.5 (0.1–1.9)
Has a diagnosis of AIDS			
No	11 087	0.4	1.0
Yes	20	15.0	44.3 (12.5–156.6)
Don't know	608	1.1	2.9 (1.3–6.5)

metropolitan Lima, and those with history of STD, jaundice, or tuberculosis (Table 1). HIV infection was not associated with occupation of the women, history of preterm delivery, history of blood transfusion, or with knowledge about AIDS or HIV risk factors.

A total of 3295 women reported 4342 previous abortions (63% spontaneous). Prior abortion was associated with HIV infection (OR, 2.4; 95% CI, 1.5–4.1), as well as abortion or miscarriage of the current pregnancy (OR, 2.3; 95% CI, 1.0–5.3). Among women enrolled postpartum, HIV seroprevalence was higher among women with fewer than three prenatal visits than among women with ≥ 3 prenatal visits.

Most women (82.5%) reported never using a condom with the current partner. HIV infection was significantly associated with first intercourse at ≤ 18 years of age, history of anal sex with the current partner, and number of previous sexual partners. However, only 362 (3.4%) reported two previous partners, and only 75 (0.6%) reported three or more. Of 50 HIV seropositive women, only six reported more than two partners. HIV infection was associated with shorter duration of current relationship, and with alcohol intoxication at least once per month, but not with history of involuntary first intercourse.

Perceived risk profile of current sex partners associated with HIV seropositivity of participants

For the 94.3% of women with a current sex partner, HIV seropositivity was associated with the woman's perception that her partner was a 'womanizer', frequented FSW, had sex with other men, used injecting drugs, other illegal drugs, or excessive alcohol, had a history of tuberculosis, STD, or diagnosis of AIDS, and also with her uncertainty about whether her partner had other current partners (Table 2).

Multivariate models for factors associated with HIV seropositivity

After adjusting for adequacy of prenatal care, miscarriage or abortion, HIV remained significantly associated with the participant's sexual debut at or by 18 years or younger (OR, 1.8; 95% CI, 1.0–3.2), and with her number of previous sexual relationships: for each additional relationship above one, HIV seroprevalence increased by 50%, up to four or more relationships. HIV was negatively associated with duration of the current partnership; for each year of the partnership, the woman's risk for HIV decreased by approximately 35% (data not shown). For women with a current partner, HIV was associated with her perception of him as a 'womanizer' (OR, 2.0; 95% CI, 1.1–3.8) or illegal drug user (OR, 3.1; 95% CI, 1.3–7.2). Other perceived risk behaviors of current male partners did not remain significant in the multivariate model, probably because the two significant variables ('womanizer' and 'illegal drug abuse') capture most partners engaging in risk behaviors. Other risk factors or risk markers for HIV infection that remained significant in the model included partner with HIV/AIDS (OR, 26.8; 95% CI, 6.7–108), and the woman's history of STD (OR, 2.8; 95% CI, 1.3–6.3), tuberculosis (OR,

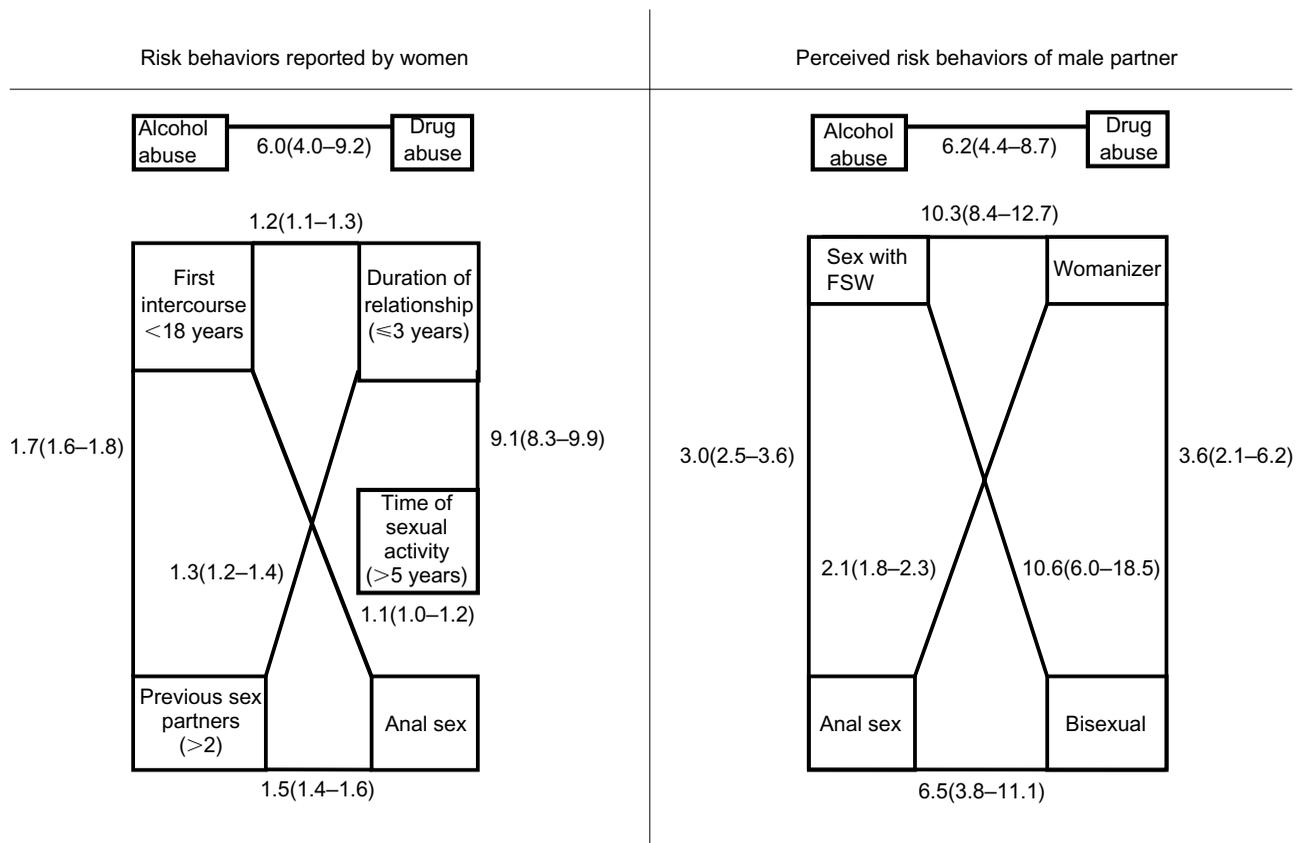


Fig. 1. Interrelationships of behavioral risk factors of women, and of their male partner (as perceived by the women). Numbers show odds ratios (95% confidence interval); risk behavior variables of partners were coded as Yes or No.

4.6; 95% CI, 2.0–10.4), or abortion (OR, 2.4; 95% CI, 1.3–4.3).

Fig. 1 depicts the complex interrelationships between the variables associated with seroprevalence of HIV infections, and shows strong associations between various sexual behaviors of partners, and between alcohol abuse and illegal drug use both for women and their partners.

Discussion

This study provides the most comprehensive picture yet available from Latin America of the epidemiology of HIV infection among heterosexual women. Smaller concurrent studies of pregnant women in Latin America found HIV prevalences of 0.3% in Fortaleza, Brazil [13], 0.4% in Campinas, Brazil [14], and 0.8% in Puerto Rico [15]. Since 1997, the prevalence of HIV infection among pregnant women in Lima has remained stable at 0.2–0.3% [16].

While sexual behaviors of women and of their male partners were both associated with the women's HIV infection, this study confirms the prominent role of sexual behaviors of men in driving transmission of STD (only 12% of HIV seropositive women reported ever having more than two partners). Although the association of HIV infection with a woman's perception of her partner's contact with FSW was weaker than the association with her perception of his bisexuality, FSW contact was perceived by the women as far more common than MSM contact. As found elsewhere [17,18], it is difficult to disaggregate these various risk behaviors of men (as perceived by the women in this study) in assigning their relative contributions to HIV infection of the women. All probably contribute. We report results of more detailed interviews of HIV seropositive and seronegative pregnant women, and of their male partners, regarding their sexual behaviors separately [19].

In multivariate analyses, longer duration of current relationship appeared protective against HIV; with 77% of these pregnant women still unmarried, the socio-cultural determinants of pregnancy warrant further study. The associations of HIV infection with syphilis seroreactivity and with other STD after adjusting for risk behaviors supports the role of other STD as cofactors in the heterosexual HIV epidemic in Peru. The association of HIV with lack of prenatal care, found elsewhere [20], may reflect undefined socio-cultural confounders. Risk for HIV infection may be influenced by the geographic distribution of HIV infection in Latin America, the characteristics of internal migration [21], and the cultural differences between urban and rural areas.

Although HIV seropositive pregnant women may under-represent all HIV seropositive women [22], and may not reflect either the true HIV seroprevalence or the distribution of risk behaviors in all women, routine testing of pregnant women is not subject to systematic bias related to patterns of referral, to clinical manifestations of HIV infection *per se*, or to risk behaviors *per se*. Further, the study found that women receiving prenatal or postpartum care could identify and report their own risk behaviors as well as those of their partners. This may reflect increasing access of women to education and the labor market in Peru [23]. Younger women seemed the most willing and able to discuss sexual behavior. Because young women had the highest prevalence of HIV, their willingness to discuss sexual behavior is encouraging for the feasibility of behavioral interventions, which should focus on groups at highest risk, and should address risk behaviors identified.

Future research could include qualitative studies on reasons for deferral of marriage, reasons for choosing male partners perceived as 'risky,' and potential strategies women could learn for avoiding such partners.

Recommendations arising from this study are: to link programs for reproductive health in Latin America with HIV prevention programs; to promote interventions involving both members of a couple, encouraging more stable relationships and mutually protective practices; and to target school-age youth for STD/HIV prevention education and counseling, as 19% of women in this study had first sexual intercourse before the age of 16 years and because male adolescents are often exposed to illegal drug use, bisexual behavior, and commercial sex [24,25].

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