

Reproductive tract infections in rural women from the highlands, jungle, and coastal regions of Peru

Patricia J. García,^{1,2} Susana Chavez,^{3,4} Barbara Feringa,⁴ Marina Chiappe,² Weili Li,³ Kathrin U. Jansen,⁵ César Cárcamo,^{1,2} & King K. Holmes¹

Objective To define the prevalences and manifestations of reproductive tract infections (RTIs) in rural Peruvian women.

Methods During 1997–98, we visited 18 rural districts in coastal, highlands, and jungle regions of Peru. We administered standardized questionnaires and pelvic examinations to members of women's community-based organizations; and collected vaginal fluid for pH, amine odour, Gram stain, microscopy, and culture for *Trichomonas vaginalis*; cervical specimens for *Chlamydia trachomatis*, *Neisseria gonorrhoeae*; human papilloma virus (HPV) by polymerase chain reaction (PCR) assays, and blood for syphilis serology.

Findings The 754 participants averaged 36.9 years of age and 1.7 sex partners ever; 77% reported symptoms indicative of RTIs; 51% and 26% reported their symptoms spontaneously or only with specific questioning, respectively. Symptoms reported spontaneously included abnormal vaginal discharge (29.3% and 22.9%, respectively). One or more RTIs, found in 70.4% of participants, included bacterial vaginosis (43.7%), trichomoniasis (16.5%), vulvovaginal candidiasis (4.5%), chlamydial infection (6.8%), gonorrhoea (1.2%), syphilis seropositivity (1.7%), cervical HPV infection (4.9%), and genital warts or ulcers (2.8%). Of 715 adequate Pap smears, 7 revealed cancer, 4 high-grade squamous intra-epithelial lesions (SIL) and 15 low-grade SIL. Clinical algorithms had very low sensitivity and predictive values for cervical infection, but over half the women with symptoms of malodorous vaginal discharge, signs of abnormal vaginal discharge, or both, had bacterial vaginosis or trichomoniasis.

Conclusion Overall, 77% of women had symptoms indicative of RTIs, and 70% had objective evidence of one or more RTIs. Women with selected symptoms and signs of vaginal infection could benefit from standard metronidazole therapy.

Keywords *Trichomonas vaginitis/diagnosis/therapy; Chlamydia infections/diagnosis/therapy; Gonorrhoea/diagnosis/therapy; Papillomavirus infections/diagnosis/therapy; Syphilis/diagnosis/therapy; Sexually transmitted diseases, Bacterial/diagnosis; Vaginal discharge/therapy; Risk factors; Peru (source: MeSH, NLM).*

Mots clés *Trichomonas vaginalis/diagnostic/thérapeutique; Chlamydia, Infection/diagnostic/thérapeutique; Gonococcie/diagnostic/thérapeutique; Papillomavirus, Infections/diagnostic/thérapeutique; Syphilis/diagnostic/thérapeutique; Maladies sexuellement transmissibles bactériennes /diagnostic; Perte vaginale/thérapeutique; Facteur risque; Pérou (source: MeSH, INSERM).*

Palabras clave *Trichomonas vaginalis/diagnóstico/terapia; Infecciones por chlamydia/diagnóstico; Gonorrea/diagnóstico/terapia; Infecciones por papillomavirus/diagnóstico/terapia; Sífilis/diagnóstico/terapia; Enfermedades bacterianas sexualmente transmisibles/diagnóstico; Excreción vaginal/terapia; Factores de riesgo; Perú (fuente: DeCS, BIREME).*

الكلمات المفتاحية: تشخيص ومعالجة عدوى المشعرات المهبليّة؛ تشخيص ومعالجة عداوى المتدثرة الحثريّة؛ تشخيص ومعالجة السيلان؛ تشخيص ومعالجة عداوى فيروس الورم الحليمي؛ تشخيص ومعالجة الزهري؛ تشخيص الأمراض الجرثومية المنقولة جنسياً؛ معالجة المقرزات المهبليّة؛ عوامل الخطر؛ بيرو (المصدر: رؤوس الموضوعات الطبيّة المكتب الإقليمي لشرق المتوسط).

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Introduction

The ReproSalud Project in Peru was started in 1997 to promote the improvement of reproductive health of women in rural Peru. Movimiento Manuela Ramos carried out initial qualitative research in 240 women's community-based organizations (CBOs) throughout Peru using participatory techniques for reproductive health self-assessments (1). Women in 16 of 18 rural districts

identified vaginal discharge as one of their three most important reproductive health problems. ReproSalud commissioned the present study to assess the prevalence and manifestations of vaginal infections and other reproductive tract infections (RTIs); risk factors; and potential utility of algorithms for the syndromic management of vaginal discharge in these rural settings.

¹ Center for AIDS and STDs, University of Washington, Harborview Medical Center Box 359931, 325 9th Ave, Seattle, WA 98104, Washington, DC, USA
Correspondence should be sent to Dr Holmes (email: worthy@u.washington.edu).

² School of Public Health and Administration, Universidad Peruana Cayetano Heredia, Lima, Peru.

³ Movimiento Manuela Ramos, Lima, Peru.

⁴ Proyecto ReproSalud USAID, Washington DC, USA.

⁵ Merck Research Laboratories, West Point, PA, USA.

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Methods

Between December 1997 and June 1998, a driver; two midwives trained to perform pelvic examination and to recognize pelvic inflammatory disease, mucopurulent cervicitis (MPC) and abnormal vaginal discharge; a nurse, trained to interview; and a microbiologist trained for 6 months at the University of Washington for this study travelled to 18 districts, enrolling 754 women.

Study areas and study population

The investigation was conducted in rural villages selected from the 18 districts included in the ReproSalud Project, all of which are underserved in all areas, where more than 70% of households had unmet basic needs. All women from CBOs (called mother's clubs) within these villages were invited to participate. Local ReproSalud teams reported total active membership of these 18 CBOs as 944; of these, 754 (80%) participated.

Table 1 presents the characteristics of participants by region. Participants averaged 36.9 years of age (range 18 to 67 years), with 19.1% aged 18–25, 31% aged 26–35, 25.7% aged 36–45, 15.5% aged 46–55, and 8.6% aged >55 years. Approximately 21% were illiterate, just over half had primary education, and education duration averaged 5 years. Most spoke Spanish, although some spoke Quechua (52.8%), Aymara (9%), or Shipibo (4.6%) with or without Spanish; 6% were single mothers and 28% were unmarried and cohabitating.

Study procedures

At the CBO building or local health centre, the study nurse, assisted by translators who were fluent in indigenous languages, read and explained the consent form to the participants, obtained their verbal informed consent, and interviewed them in a confidential setting. The midwife then examined their vulva, perineum, vagina, and cervix, and palpated for adnexal and cervical motion tenderness. During speculum examination, the midwife collected vaginal and endocervical samples and blood for laboratory testing.

Laboratory

The microbiologist determined vaginal fluid pH by using colorpHast strips (MCB reagents, Gibbstown, NJ). She also mixed vaginal fluid 1:1 with saline to detect motile trichomonads and clue cells, and with 10% potassium hydroxide (KOH) to detect fungal hyphae by microscopic examination and amine-like odour. Vaginal fluid smears were evaluated by Gram's stain for fungal elements and Nugent's score (2). To test for *Trichomonas vaginalis* she inoculated vaginal fluid into InPouch TV tests for microscopic examination before and after incubation at 37 °C for 24 and 48 hours. She stained and examined cervical specimens for Gram-negative diplococci and quantitated neutrophils within cervical mucus.

We froze rapid plasma reagin (RPR)-positive specimens for subsequent confirmatory *Treponema pallidum* haemagglutination assay testing. We placed cervical swabs in polymerase chain reaction (PCR) medium, which were then refrigerated for up to 12 hours, transported to Lima on dry ice, and stored at –70 °C. The swabs were tested for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, using Roche Molecular Diagnostics reagents, and for human human papilloma virus (HPV) DNA types 6, 11, 16, 18 and human beta-globin, using Merck's multiplex type-specific PCR assay.

Definitions

The following criteria were used for diagnosis: bacterial vaginosis (BV), Amsel criteria (3) or Nugent's Gram stain score of 7–10 (4); vaginal trichomoniasis (TV), observation of motile trichomonads on microscopic examination of vaginal secretions, or isolation of *T. vaginalis* by culture; vulvovaginal candidiasis, pseudohyphae in vaginal fluid by Gram's stain or KOH wet mount; MPC, yellow endocervical discharge, Gram stain of endocervical mucus showing ≥ 30 neutrophils per $\times 1000$ field, or easily-induced cervical bleeding; pelvic inflammatory disease, MPC plus cervical motion tenderness and adnexal tenderness; gonorrhoea and chlamydial infection, positive PCR test; syphilis seropositivity, RPR test reactive, confirmed by *Treponema pallidum* haemagglutination assay; cervical cytology, classified using the Bethesda system (5); and HPV, positive PCR assay.

Treatment

We followed WHO (6) and national guidelines on treating women with sexually transmitted diseases. We gave women metronidazole 2 g orally for BV or trichomoniasis; clotrimazole vaginal cream for vulvovaginal candidiasis; ciprofloxacin 500 mg orally, plus doxycycline 100 mg orally twice daily for 7 days or azithromycin 1 g orally for MPC or Gram stain indicative of gonorrhoea; and benzathine penicillin 2.4 MU intramuscularly for positive RPR test. We offered counselling and partner treatment for trichomoniasis, syphilis seropositivity, and MPC or Gram stain indicative of gonorrhoea, and referred pregnant women to the nearest health centre. Local ReproSalud representatives provided referrals and financial and logistic support for treating all women with abnormal Pap smears requiring treatment.

Ethical review

Institutional Review Boards of the University of Washington and the Universidad Peruana Cayetano Heredia approved the protocol.

Data analysis

We used SPSS (version 10.0, Chicago, IL) for data entry and analyses, Student's *t*-test for univariate analyses, unconditional logistic regression in multivariate models for calculating adjusted odd ratios and confidence intervals, and EpiCalc 2000 (Version 1.02) to estimate crude odds ratios (OR) and their confidence intervals. (See Table 5 for a description of the multivariate models used for each analysis.)

Results

Medical and sexual history of respondents and their partners

Table 1 summarizes, by jungle, highlands, and coastal regions, the respondents' gynaecological and obstetrical history, contraception, sexual behaviours, and their perceptions of their partners' sexual behaviours and genital symptoms.

Gynaecological and obstetric history

Age of menarche averaged 13.9 years. The numbers of pregnancies averaged 5.4 (range 0–17), live births 4.8 (0–14), and living children 3.9 (0–12); all the numbers were highest in the jungle and lowest on the coast. Only 20 women reported no pregnancies. Abortion history (type unspecified) increased steadily from 14.4% (16/111) of women with one child to 42.1% (77/183) of women with ≥ 6 living children ($P < 0.001$).

Table 1. Demographics, obstetric, and gynaecological history, and behavioural characteristics of women participating in the study

Characteristic	No. of women		
	Jungle (<i>n</i> = 186)	Highlands (<i>n</i> = 495)	Coast (<i>n</i> = 73)
Age mean (range)	39.2 (18–67)	36.4 (18–65)	35.3 (18–58)
Language			
Spanish only	133; 71.5	47; 9.5	73; 100
Quechua or Aymara, ± Spanish	18; 9.7	448; 90.5	0
Shipibo ± Spanish	35; 18.8	0	0
Marital status			
Single	6; 3.2	33; 6.7	6; 8.2
Married	71; 38.2	292; 59.2	31; 42.5
Living together	84; 45.2	102; 20.7	29; 39.7
Divorced/separated	10; 5.4	25; 5	6; 8.2
Widow	15; 8	41; 8.3	1; 1.4
Level of education			
None	20; 10.8	132; 26.7	6; 8.2
Some primary school	90; 48.4	253; 51	43; 58.9
Some secondary	65; 34.9	96; 19.4	20; 27.4
Some technical or university	11; 5.9	14; 2.8	4; 5.5
Occupation			
Housewife	50; 26.8	101; 20.4	35; 47.9
Small business	31; 16.7	33; 6.7	10; 13.7
Farmer	70; 37.6	322; 65	13; 17.8
Obstetric and gynaecological history			
Mean no. of pregnancies	5.9	5.4	4.4
Mean no. of live births	5.1	4.9	3.9
Mean no. of children alive	4.1	3.9	3.4
No. with at least one abortion	87; 47	129; 26.1	25; 34.2
Contraceptive practices			
None or coitus interruptus	100; 54	308; 72.2	46; 63.0
Rhythm	8; 4.3	67; 13.5	2; 2.7
Condom use, last intercourse	1; 0.5	13; 2.6	2; 2.7
Injections or birth control pills	40; 21.6	47; 9.5	6; 8.2
Intrauterine device	10; 5.4	33; 6.7	9; 12.3
Tubal ligation	26; 14.1	27; 5.5	8; 11
Sexual behaviour			
Mean age at first intercourse	16.6	17.6	17.7
Mean lifetime no. of sex partners (median)	2 (2)	1.6 (1)	1.8 (1)
Lifetime no. of sex partners >2	53; 28.5	59; 11.9	13; 17.8
Mean no. of partners in past year	0.88	0.86	0.93
Partner sexual behaviour and symptoms			
Sex with prostitutes (ever)	34; 34	67; 16.9	7; 11.7
Sex with other women (past year)	36; 36	54; 13.6	14; 23.3
Has another partner now	39; 24.5	64; 16.1	12; 20
Has genital complaints now	18; 11.3	52; 13.1	3; 5

^a Numbers in italics are percentages.

Seven women had undergone hysterectomy, 4.6% (35/754) were pregnant, and 67.4% (508/754) reported having had previous pelvic examinations (40.4% (205/508) for Pap smear, 15.7% (80/508) prenatal/perinatal, 15.2% (77/508) for family planning, 7.3% (37/508) for evaluation of vaginal discharge, and 6.3% (32/508) for “check-up” and about 15.2% (77/508) for other very specific diagnosis, e.g. prolapse, bleeding, etc).

Contraceptives and genital hygiene

In all, 278 of the 440 women currently not using contraception had never used contraception. The method of contraception

varied by region. Of 140/754 (18.6%) who reported ever using a condom, only 16 had used a condom during their last intercourse, and only three reported always using condoms. For genital hygiene, 531 (70.4%) reported external washing; 110 (14.6%) internal washing with fingers; 95 (12.6%) bidet washing, douching, or sitz baths; and 18 (2.4%) no genital hygiene.

Sexual behaviours

Mean age at first intercourse was lower and mean lifetime number of sex partners higher for women living in the jungle than in the Andean and coastal regions ($P < 0.001$); 125 (16.6%) women

reported having had more than two lifetime partners, and four (0.5%) reported having had two partners during the past year. By contrast, nearly 20% of women perceived that their current partners had had sex with prostitutes; 20% thought that their partners had had sex with other women in the past year; and 20% believed that their partner had another current partner. A higher percentage of jungle residents perceived that their partners had engaged in these activities compared with Andean and coastal residents.

Past RTIs and related health-care-seeking behaviours

When the women were asked: "Have you ever had had an infection in your private parts?", 405 (54.1%) answered "yes". Of these, 387 described having specific symptoms or diagnoses: 243 had experienced vaginal discharge, 55 vulvar itching or pain, 34 lower abdominal pain or pelvic inflammation, 31 urinary symptoms, 15 cervical ulcer or inflammation, 4 ovarian infection, 3 genital ulcers, and 2 dyspareunia. When asked directly about genital ulcers, 71 women reported a history of genital ulcers, and 65 reported their partners had this history.

In all, 353 of the 405 women who had experienced infection in the past answered the question about health care seeking for the infection. Of those, 83 (23.5%) reported never having sought help, 170 (48.2%) had gone to a public clinic and 30 (8.5%) to a private physician, 43 (12.2%) self-medicated, and 27 (7.6%) sought help from friends, traditional healers or pharmacies. Of those seeking help, only 29% obtained treatment, and most of this was self-medication.

Clinical and laboratory findings Symptoms of RTIs

When the women were asked why they came to be screened, 275 volunteered no complaints, and 479 volunteered 535 complaints (Table 2). Overall, 76.9% either spontaneously volunteered symptoms or reported elicited symptoms possibly related to RTIs.

Objective signs and laboratory evidence of RTIs. Overall, we found objective clinical and laboratory evidence of one or more RTIs in 531 (70.4%) women; 38.4% had evidence of two or more RTIs (Table 3).

Vaginal infection. The midwife observed vaginal discharge in 412 women, which was abnormal (moderately or profusely increased amount, yellow, or homogeneous, liquid consistency) in 39.3% (296) of all women included in the study. Microscopy revealed fungal hyphae in 4.5% (34 of 752 tested). We found BV in 33.6% by Amsel criteria, in 40.8% by Nugent score ($\kappa = 0.72$), by both criteria in 30.6%, and by either criterion in 43.7%; and *T. vaginalis* in 11.5% by direct microscopy, in 15.3% by culture ($\kappa = 0.73$), and in 16.5% by either test. Overall, of 748 tested for both BV and trichomoniasis, 49.5% (370) had either vaginal infection by any criterion.

Endocervical infection. Any of three criteria for MPC were detected in 46.6% ($\kappa =$ only 0.09 between yellow exudate and ≥ 30 neutrophils). PCR tests detected *N. gonorrhoeae* and *C. trachomatis* in 51 (6.8%) and 9 (1.2%) women, respectively, including four who had both infections and 56 (7.4%) who had either infection.

Pelvic inflammatory disease. Cervical motion tenderness was noted in 104 (14.4%) of 720 women, adnexal tenderness in 43 (6.0%), and both types plus MPC (meeting our criterion for pelvic inflammatory disease) in 11 women (1.5%).

Syphilis seroreactivity. RPR tests for syphilis reacted in the field in 22 (2.9%) of 746 patients; *Treponema pallidum* haemagglutination assay later confirmed the presence of syphilis in 13 of the 22 patients.

Cervical cytology and HPV

Of 732 Pap smears taken, 17 were inadequate and not repeated, 3 showed invasive cervical cancer; 4, high-grade squamous intra-epithelial lesions (SIL); 15, low-grade SIL; 5, atypical squamous cells of uncertain significance; and 4, atypical glandular cells of uncertain significance. Of 581 cervical specimens taken consecutively, 27 (4.6%) contained cervical HPV 6, 11, 16, or 18, including 8 that contained HPV 6 alone, 1, HPV 11; 15, HPV 16 alone; 3, HPV 18 alone; 1, HPV 11, 16 and 18; and 2, HPV 6 and 16. Of the 27 HPV-positive women, 24 had Pap smears, of which only two were interpreted as low-grade SIL (one HPV 6 and the other HPV 6 and 16) and two as invasive cancer (both HPV 16-positive).

Associations between clinical and laboratory findings

The presence of BV or TV was weakly associated with spontaneous complaints of abnormal vaginal discharge ($P = 0.06$), and with elicited symptoms of malodorous vaginal discharge ($P = 0.08$, Table 4). Genital pruritis was not associated with fungal hyphae (data not shown), BV, or TV. Abnormal vaginal discharge on examination (including especially yellow colour or liquid, homogenous consistency) was significantly associated with BV or TV. The presence of any of the three signs of abnormal vaginal discharge correlated independently and significantly with the detection of BV (OR, 1.9) (sensitivity 48%, positive predictive value (PPV) 25%), with trichomoniasis

Table 2. Spontaneous and elicited complaints of RTIs^a by Peruvian women

Complaint	No. of women ^b (n = 754)
Spontaneous	
None	275; 36.5
Complaints unrelated to RTIs	93; 12.3
Complaints possibly related to RTIs:	396; 51.2
Abnormal vaginal discharge ("regla blanca")	173; 22.9
Lower abdominal pain	221; 29.3
Vulvovaginal itching	31; 4.1
Dyspareunia	9; 1.2
Vaginal bleeding	6; 0.8
Elicited	
Vaginal discharge	461; 61.1
Lower abdominal pain	147; 19.5
Malodorous vaginal discharge	154; 20.4
Vulvovaginal itching	123; 16.3
Non-menstrual vaginal bleeding	156; 20.7
Post-coital bleeding	64; 8.5
Dyspareunia	37; 4.9
Genital ulcer	221; 29.3
At least one spontaneous or elicited symptom possibly related to RTIs	20; 2.7
	380; 76.9

^a RTIs = reproductive tract infections.

^b Numbers in italics are percentages.

Table 3. Prevalences of clinical signs of RTIs^a and laboratory-confirmed RTIs

RTI	No. of women	
	Tested	Positive ^b
Candida hyphae	752	34; 4.5
Bacterial vaginosis	748	
By Amsel criteria		251; 33.6
By Nugent criteria		305; 40.8
By either criteria		327; 43.7
By both criteria		229; 30.6
Trichomoniasis	751	
By saline wet mount		86; 11.5
By culture		115; 15.3
By either		124; 16.5
Cervicitis		
Yellow endocervical discharge	736	42; 5.7
≥30 neutrophils per 1000× microscopic field in cervical mucus	740	183; 24.7
Easily-induced cervical bleeding	736	210; 28.5
Mucopurulent endocervicitis (any of the above)	740	345; 46.6
Cervical infections		
PCR ^c <i>Neisseria gonorrhoeae</i>	752	9; 1.2
PCR <i>Chlamydia trachomatis</i>	752	51; 6.8
Pelvic inflammatory disease (adnexal and cervical motion tenderness plus mucopurulent cervicitis)	733	11; 1.5
Syphilis seroreactivity	746	
Rapid plasma reagin reactive		22; 2.9
TPHA ^d confirmatory		13; 1.7
Cervical HPV^{e, f}	576	
HPV 16		17; 3.0
HPV 6		9; 1.6
HPV 18		4; 0.7
HPV 11		1; 0.2
Any of these HPV types		29; 5.0
Other		
Genital warts	752	18; 2.4
Genital ulcer	752	3; 0.4
Any of the above	752	531; 70.6

^a RTIs = reproductive tract infections.

^b Numbers in italics are percentages.

^c PCR = polymerase chain reaction.

^d TPHA = *Treponema pallidum* haemagglutination assay.

^e HPV = human papilloma virus.

^f Five specimens were not amplifiable.

(OR, 2.7, sensitivity 60%, PPV 25%), and with the detection of fungal hyphae (OR, 3.3).

Neither symptoms nor signs of abnormal vaginal discharge were associated with gonococcal or chlamydial infection (Table 4). However, easily-induced cervical bleeding and clinical diagnosis of MPC were significantly associated with endocervical infection. Neither low abdominal pain, nor diagnosis of pelvic inflammatory disease in 11 women (1.5%), was associated with endocervical infection. Fig. 1 shows the relationships

between spontaneous complaints of vaginal discharge, elicited symptoms of malodorous discharge, signs of abnormal vaginal discharge, and test results for vaginal and cervical infections. Symptoms and signs of abnormal vaginal discharge showed no relationship to cervical infections. By contrast, the prevalence of BV, TV, or both ranged from 31% of those with no such symptoms or signs, to 75% of patients with spontaneous or elicited symptoms, plus signs.

Other risk factors associated with RTIs

Table 5 presents univariate and multivariate analyses of risk factors associated with BV, TV, and chlamydial infection. In multivariate models BV remained associated with the Aymara language, partner's sex with another partner, and TV; TV remained associated with coastal or highlands residence, number of partners in the past year, and BV; and chlamydial infection remained associated with secondary education, lifetime number of partners, TV, genital symptoms in the current partner, and hormonal contraception.

Assessment of Peruvian algorithm for syndromic management of vaginal discharge

The Peruvian algorithm for managing vaginal discharge assigns two points for partner with urethral discharge or with genital ulcers in the past 3 months; one for age <25 years; one if single or living unmarried with partner; one for more than one partner in the past 3 months; and one for a new sex partner in the past 3 months. A total score of ≥2 leads to treatment for cervical infection, as does ≥10 neutrophils per ×1000 microscopic field in cervical mucus. For gonorrhoea (prevalence 1.2%), the algorithm's sensitivity was 33.3% and PPV 1.8%. For chlamydial infection (prevalence 6.8%), sensitivity was 35.3%, and PPV 11%. For either infection (prevalence 7.4%), sensitivity was 33.9%, PPV 11.7%. Thus, the algorithm has little utility for managing either infection in the settings and populations studied.

Discussion

Over half the participants spontaneously reported symptoms that might be attributable to RTIs; another quarter acknowledged such symptoms when specifically questioned. This included 47% with spontaneous or elicited complaints of vaginal discharge, and 49% with spontaneous or elicited complaints of lower abdominal pain. On examination, vaginal discharge appeared moderate or profuse, yellow, or liquid and homogeneous in 29.3%; 46.6% of women met criteria for MPC and 1.5% for pelvic inflammatory disease. BV, TV, or both, were evident in 50% of women. Surprisingly, given that the women are mothers with an average of one partner, and therefore considered to be low risk, chlamydial infection prevalence was ≥6.0%, trichomoniasis ≥15%, BV ≥36%, and MPC ≥40% for each decade of life up to and including 46–55 years of age, and 1% had cytological evidence of cervical cancer. The women's symptoms had little potential for use in algorithms for managing cervical infection. Although the signs of MPC and risk factors were significantly associated with cervical infection, the sensitivity and PPV of the Peruvian algorithm was too low to warrant its use in this setting, even with speculum examination and microscopy.

Strengths and weaknesses of the study

The strengths of our study included the qualitative ReproSalud

Table 4. Associations of symptoms and signs^a with vaginal infections (bacterial vaginosis and/or trichomoniasis) and with endocervical infections with *Neisseria gonorrhoeae* or *Chlamydia trachomatis*

Symptom or complaint	No. of women ^b		Odds ratio (95% CI)	No. of women ^b		Odds ratio (95% CI)
	BV ^c or TV ^d or both present (n = 369)	BV and TV absent (n = 385)		CT ^e or GC ^f or both present (n = 56)	CT and GC absent (n = 696)	
Symptoms of abnormal vaginal discharge (VD)						
Spontaneous complaint of abnormal VD	96; 26.0	77; 20.0	1.4 (1.0–2.0) ^g	15; 26.8	158; 22.7	1.2 (0.7–2.3)
Elicited symptom (not spontaneous complaint) of abnormal VD	65; 17.6	82; 21.3	0.8 (0.6–1.1)	9; 16.1	136; 19.5	0.8 (0.4–1.7)
Elicited symptom (not spontaneous complaint) of malodorous VD	69; 18.7	54; 14.0	1.4 (1.0–2.0)	9; 16.1	113; 16.2	1.0 (0.4–2.7)
Symptoms of abdominal pain						
Spontaneous complaint of abdominal pain	107; 29.0	114; 29.6	1.0 (0.7–1.3)	15; 26.8	205; 29.4	0.9 (0.5–1.6)
Elicited symptom (not spontaneous complaint) of abdominal pain	72; 19.5	82; 21.3	0.9 (0.6–1.3)	14; 25.0	140; 20.1	1.3 (0.7–2.5)
Abnormal vaginal discharge on examination						
Any of the signs below	179; 48.5	117; 30.4	2.2 (1.6–2.8) ^h	25; 44.6	271 ⁱ ; 39.0	1.3 (0.7–2.2)
Moderate or profuse amount	96; 26.0	69; 17.9	1.1 (0.7–1.6)	13; 23.2	152; 21.8	0.8 (0.4–1.6)
Liquid homogenous vaginal discharge	120; 32.5	50; 13.0	2.6 (1.7–4.0) ^h	15; 26.8	155; 22.3	1.0 (0.5–1.9)
Yellow vaginal discharge	93; 25.2	37; 9.6	2.4 (1.6–3.8) ^h	9; 16.1	121; 17.4	0.7 (0.3–1.5)
Cervicitis						
Yellow endocervical exudates	NA ^j	NA	NA	4; 7.1	38 ^k ; 5.5	1.3 (0.4–4.0)
>30 neutrophils/1000× field in cervical mucus	NA	NA	NA	18; 32.1	165; 24.2	1.5 (0.8–2.7)
Easily induced cervical bleeding	NA	NA	NA	25; 44.6	185; 26.6	2.2 (1.2–3.7)
Mucopurulent cervicitis (any of the above three findings)	NA	NA	NA	35; 62.5	310; 44.5	2.0 (1.2–3.5) ^h
Pelvic inflammatory disease (adnexal plus cervical motion tenderness plus mucopurulent cervicitis)						
	NA	NA	NA	0; 0	11; 1.6	– (–)

^a Denominators vary slightly.

^b Numbers in italics are percentages.

^c BV = bacterial vaginosis.

^d TV = trichomoniasis.

^e CT = *Chlamydia trachomatis*.

^f GC = *Neisseria gonorrhoeae*.

^g $P = 0.06$.

^h $P < 0.05$.

ⁱ Denominator = 695.

^j NA = not applicable.

^k Denominator = 690.

^l Denominator = 683.

self-assessment, which motivated our study; the use of standardized questionnaires (translators where needed); standardized objective criteria for clinical diagnoses; sensitive, specific tests for laboratory diagnosis of current RTIs; and clinically and biologically plausible analyses (e.g. the relationship of cervical infections to manifestations of cervicitis, and of vaginal infections to manifestations of abnormal vaginal discharge).

The limitations included sampling from women's CBOs, not random sampling of community women. This selection bias could have influenced the generalizability of our results, the quality of self-reports of symptoms, or the prevalences of infections. Clinic-based studies of women who access medical services presented similar biases. Nonetheless, studies of women belonging to CBOs offer advantages of feasibility, low cost, low respondent refusal rates and a potentially direct link between research and subsequent utilization of resulting improvements in services (7).

Previous reports of rural women from Asia and Africa have identified varying prevalences of the various RTIs sought (8–16), which were often similar to our findings. A

recent community-based survey of RTIs in rural women in China found vaginal or cervical infections in nearly half of the women, with no correlations of RTIs with symptoms or signs of infection (16).

Poor correlation of signs and symptoms with infection

There are several possible explanations for the poor correlations of symptoms and signs with infection observed in many of these studies. For example, prevalent infections are asymptomatic more often than acute incident infections (2, 17, 18); multiple co-infections or non-infectious conditions could produce multiple symptoms, resulting in non-specificity of symptoms and signs, relative to any one infection (2); poor tests can have low sensitivity or specificity for active infections; unknown proportions of certain syndromes (e.g. cervicitis) remain idiopathic, and not all known causes have been sought (19); elicitation of symptoms may be non-specific (e.g. "Do you have a vaginal discharge?") or specific (e.g. "Do you have abnormally increased amount, more yellow colour, or worse odour of discharge than what is usual for you?"); elicitation of signs inaccurately by

inexperienced clinicians (20) can yield misclassification bias (21); women may under-report symptoms (e.g. if embarrassed or perceive stigma) or over-report (to obtain medications); cultural or psychological factors may influence perception or reporting of symptoms (22, 23); and some women may be unable to articulate the names of symptoms in ways that are understood by interviewers (24–26).

Studies in clinical settings that primarily serve healthy asymptomatic women (e.g. antenatal and family-planning clinics) have also found that elicited symptoms of vaginal discharge or low abdominal pain have not predicted cervical infections with gonorrhoea or chlamydial infection. Nonetheless, efforts to somehow make this approach more effective continue. This is analogous to the question posed — not uncommonly — in clinical practice: “I know this test is ineffective, but can you advise me on how to use it in my practice?”. In clinical settings that serve women who are seeking care specifically for symptoms of RTIs and who have substantially higher prevalences of cervical infections, pelvic examination can yield better correlations with actual infections. For example, in primary health care, gynaecology, or STD (sexually transmitted disease) clinic settings, signs of MPC or pelvic inflammatory disease are more likely to reflect incident cervical infection (2, 17, 18), often yielding positive predictive values high enough to warrant treatment (with benefits outweighing the costs and adverse effects of medications, other programme costs, and increased pressure for selection of

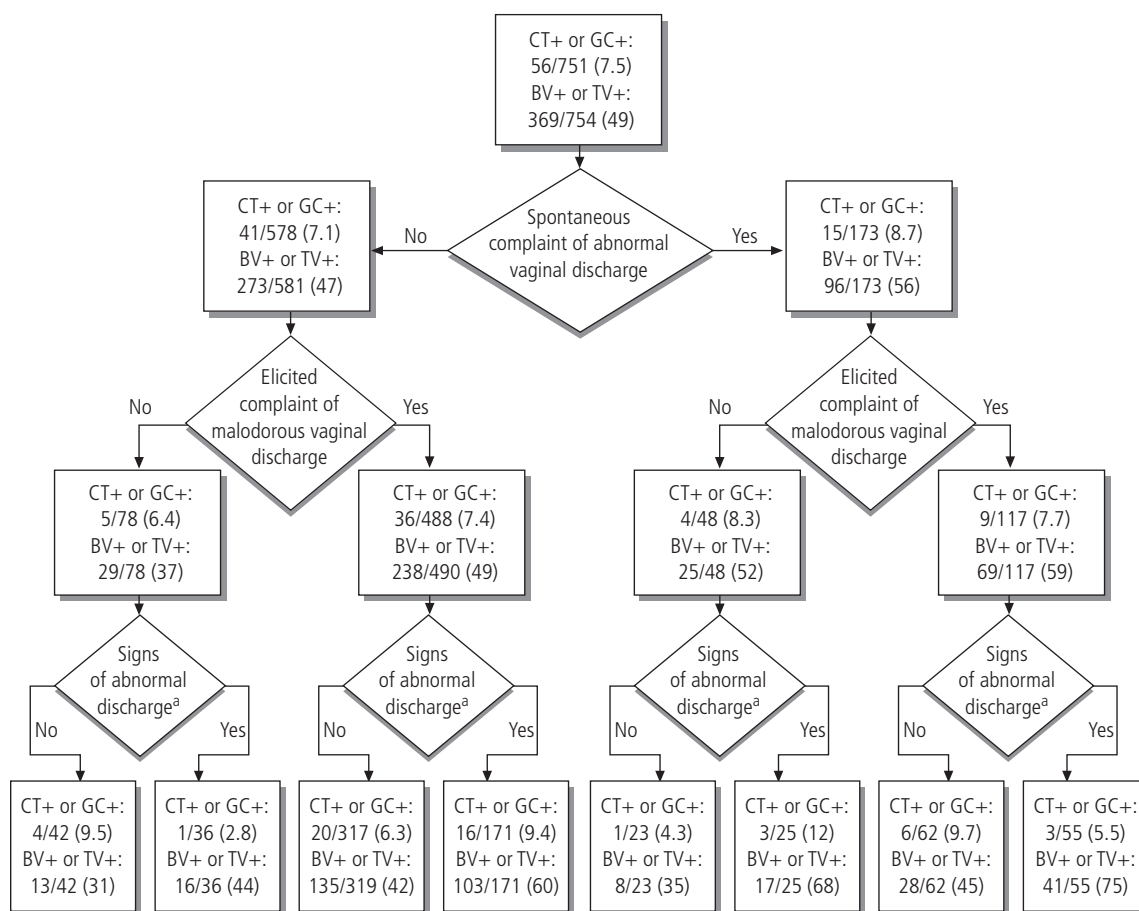
antimicrobial resistant pathogens) (2, 17, 18).

Similarly, the elicitation of symptoms and signs of abnormal vaginal discharge, as defined here, have been predictive of trichomoniasis, bacterial vaginosis, or both, in such clinical settings, including in Peru (27). Even among these rural Peruvian women, the very high prevalence of BV or trichomoniasis (57%) associated with symptoms of malodorous vaginal discharge or with signs of vaginal discharge suggest the potential clinical benefit of metronidazole treatment (although recurrences of BV following metronidazole therapy, (22) and the need to treat male partners to minimize recurrences of vaginal trichomoniasis (28), currently limit this strategy). This suggestion is particularly relevant, not only because of the obstetrical and gynaecological complications of BV and trichomoniasis and possible associations of vaginal infections with susceptibility to HIV acquisition (22), but especially in view of the ReproSalud self-assessment study, in which women in 16 of 18 districts listed vaginal discharge as one of their top three reproductive health problems. Formal evaluation of the benefit of metronidazole therapy in relieving such perceived symptoms in rural women seems warranted.

Conclusion

On the basis of our findings, Peru’s national guidelines for the syndromic management of vaginal discharge were changed to

Fig. 1. Recursive partitioning analysis of relationships between spontaneous or elicited symptoms of abnormal vaginal discharge, signs of abnormal vaginal discharge, and detection of gonorrhoea (GC), chlamydial infection (CT), or both, by polymerase chain reaction; and of bacterial vaginosis (BV) by Amsel or Nugent criteria, trichomoniasis (TV) by culture, or both. Results are number positive/number tested (%)



^a Signs include moderate to profuse amount, liquid homogenous consistency, or yellow discharge.

Table 5. Univariate and multivariate analyses of risk factors for the most commonly-identified reproductive tract infections

Risk factors	No. of women ^a		Odds ratio	
	BV ^b (+) (n = 327)	BV (-) (n = 421)	Crude (P)	Adjusted ^{c,d} (95% CI)
Aymara (no.)	39; 11.9	29; 6.9	1.8 (0.02)	2.5 (1.2 to 5.2)
Mean no. of pregnancies	6	5	1.1 (0.02)	- (-)
Imputed median no. of perinatal deaths	1	0	1.2 (0.004)	- (-)
Partner had another partner in past year	57; 27.7	47; 19.4	1.6 (0.04)	1.7 (1.1 to 2.6)
Trichomoniasis	82; 25	41; 9.7	3.1 (0.00)	4.4 (2.4 to 8.1)
Age >25 years	275; 84.3	329; 78	1.5 (0.33)	- (-)
	TV ^e (+) (n = 124)	TV (-) (n = 627)		Adjusted ^{c,f} (95% CI)
Aymara	19; 15.3	49; 7.8	2.1 (0.009)	- (-)
Residence:				
Coast	17; 13.7	56; 8.9	3.7 (0.01)	3.8 (1.7 to 8.4)
Highlands	93; 75	401; 63	2.8 (0.01)	2.9 (1.6 to 5.5)
Mean number of partners in last year	0.87	0.77	2.04 (0.01)	1.9 (1.1 to 3.4)
Bacterial vaginosis	82; 66	245; 39	3.1 (0.00)	3.0 (1.9 to 4.5)
	CT ^g (+) (n = 51)	CT (-) (n = 701)		Adjusted ^{c,h} (95% CI)
Secondary education	24; 47	157; 22.4	3.03 (0.00)	3.5 (1.6 to 7.4)
Aymara	9; 17.6	59; 8.4	2.3 (0.03)	- (-)
Lifetime median no. of sexual partners	2	1	1.4 (0.00)	1.6 (1.2 to 2.0)
Bacterial vaginosis	30; 58.8	295; 42.5	1.9 (0.025)	- (-)
Trichomoniasis	15; 29.4	109; 15.7	2.3 (0.012)	2.4 (1.0 to 5.9)
Genital complaints in the current partner	11; 30	62; 14	3.15 (0.003)	2.3 (1.01 to 5.5)
Hormonal contraception	13; 25	80; 11.5	2.65 (0.004)	3.0 (1.2 to 7.0)

^a Unless otherwise stated. Numbers in italics are percentages.

^b BV = bacterial vaginosis.

^c (-) for adjusted odds ratio $P > 0.05$.

^d The model includes Aymara language, trichomoniasis, partner had sex with other women, age >25 years, and a term to account for the interaction between Aymara and trichomoniasis. We tested all first order interaction terms, and identified no confounders.

Log odds (BV) = $-0.592 + 1.488$ (Trichomoniasis) + 0.533 (partner has another partner) + 0.908 (Aymara) - 1.287 (Tricho) (Aymara).

^e TV = vaginal trichomoniasis.

^f The model includes residence, mean number of partners in last year, and bacterial vaginosis. We identified no interactions or confounders. Log odds (TV) = $-3.7 + 1.091$ (BV) + 1.078 (residence Highlands) + 1.333 (residence Coast) - 0.656 (mean no. of partners in last year).

^g CT = *Chlamydia trachomatis*.

^h The model includes secondary education, lifetime number of sexual partners, trichomoniasis, genital complaints in the partner, and hormonal contraception. We identified no interactions or confounders. Log odds (CT) = $-487 + 1.259$ (secondary education) + 0.452 (lifetime number of sexual partners) + 0.906 (trichomoniasis) + 0.851 (Genital complaints in current partner) + 1.092 (hormonal contraception).

recommend metronidazole for treatment for vaginal infections, and they no longer include treatment for cervical infection. ReproSalud teams helped to implement these changes and advised women in their communities of the significance of symptoms of vaginal discharge, advising appropriate health care seeking. ■

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Conflicts of interest: none declared.

Résumé

Infections génitales chez les femmes des zones rurales du Pérou (hauts plateaux, forêt tropicale et régions côtières)

Objectif Définir la prévalence et les manifestations des infections génitales chez des Péruviennes des zones rurales.

Méthodes En 1997-1998, nous avons visité 18 districts ruraux dans les régions côtières, la forêt tropicale et les hauts plateaux

du Pérou. Nous avons interrogé les femmes membres d'organisations communautaires à l'aide de questionnaires standardisés et avons procédé à un examen gynécologique sur ces mêmes femmes. Nous avons recueilli les sécrétions vaginales pour détermination du pH,

recherche d'odeur d'amine, coloration de Gram, examen au microscope et recherche de *Trichomonas vaginalis* par culture, et effectué des prélèvements cervico-vaginaux pour la recherche de *Chlamydia trachomatis* et *Neisseria gonorrhoeae* et la recherche du papillomavirus humain par amplification génique (PCR), et des prélèvements de sang pour sérologie de la syphilis.

Résultats Les 754 participantes étaient âgées en moyenne de 36,9 ans et avaient eu en moyenne 1,7 partenaire sexuel ; 77 % d'entre elles ont rapporté des symptômes évocateurs d'infections génitales (51 % spontanément et 26 % en réponse au questionnaire). Parmi les symptômes rapportés spontanément figuraient les douleurs abdominales basses et les pertes vaginales anormales (29,3 % et 22,9 % respectivement). Parmi les infections génitales trouvées isolément ou en association chez 70,4 % des participantes figuraient : vaginose bactérienne (43,7 %), trichomonase (16,5 %), candidose vulvo-vaginale (4,5 %), infection à *Chlamydia* (6,8 %), gonococcie (1,2 %), sérologie

positive pour la syphilis (1,7 %), infection cervicale à papillomavirus humain (4,9 %) et condylomes génitaux ou ulcérations génitales (2,8 %). Sur 715 tests de Papanicolaou ayant pu être réalisés, 7 ont révélé un cancer, 4 des lésions malpighiennes intra-épithéliales de haut grade et 15 des lésions malpighiennes intra-épithéliales de bas grade. Les algorithmes cliniques avaient une très faible sensibilité et une très faible valeur prédictive pour les infections du col de l'utérus, mais une vaginose bactérienne ou une trichomonase ont été trouvées chez plus de la moitié des femmes qui présentaient des symptômes de pertes vaginales malodorantes et/ou des signes de pertes vaginales anormales.

Conclusion Dans l'ensemble, 77 % des femmes présentaient des symptômes évocateurs d'infections génitales et 70 % des signes d'une ou plusieurs infections. Les femmes présentant certains signes et symptômes d'infection vaginale pourraient bénéficier d'un traitement standard par le métronidazole.

Resumen

Infecciones del tracto reproductivo en mujeres de zonas rurales del altiplano, la selva y la costa del Perú

Objetivo Determinar la prevalencia y las manifestaciones de las infecciones del tracto reproductivo (ITR) en mujeres peruanas de zonas rurales.

Métodos Durante 1997–1998 visitamos 18 distritos rurales de la costa, el altiplano y la selva del Perú. Administramos cuestionarios estandarizados y examen pélvico a las mujeres pertenecientes a las organizaciones comunitarias de base; se obtuvieron muestras de secreción vaginal para análisis de pH, olor por aminas, tinción de Gram, microscopía y cultivo de *Trichomonas vaginalis*; muestras cervicales para *Chlamydia trachomatis*, *Neisseria gonorrhoeae*; papilomavirus humano (VPH) mediante la reacción en cadena de la polimerasa (RCP), y muestras de sangre para serología de la sífilis.

Resultados La edad media de las 754 participantes fue de 36,9 años, y el número medio de parejas a lo largo de su vida era de 1,7; el 77% refirieron síntomas indicativos de ITR; un 51% declararon sus síntomas espontáneamente, y un 26% sólo en respuesta a una pregunta al respecto. Entre los síntomas declarados figuraba flujo vaginal anormal

(29,3% y 22,9%, respectivamente). En un 70,4% de las participantes se halló una o más ITR, incluidas vaginosis bacteriana (43,7%), tricomoniasis (16,5%), candidiasis vulvovaginal (4,5%), clamidiasis (6,8%), gonorrea (1,2%), seropositividad para la sífilis (1,7%), infección cervical por VPH (4,9%) y verrugas o úlceras genitales (2,8%). De las 715 pruebas de Papanicolaou realizadas, 7 revelaron la presencia de cáncer, y en 4 y 15 casos se detectaron lesiones intraepiteliales escamosas de grado alto y de grado bajo respectivamente. Los algoritmos clínicos mostraron una sensibilidad y un valor predictivo muy bajos para la infección cervical, pero más de la mitad de las mujeres con síntomas de flujo vaginal maloliente, signos de flujo vaginal anormal o ambos sufría vaginosis bacteriana o tricomoniasis.

Conclusión Globalmente, el 77% de las mujeres tenían síntomas indicativos de ITR, y un 70% presentaban signos objetivos de una o más ITR. Las mujeres con determinados síntomas y signos de infección vaginal podrían beneficiarse del tratamiento con metronidazol.

ملخص

عداوى المسلك الإنجابي بين النساء الريفيات في المناطق الجبلية والساحلية ومناطق الأدغال في بيرو

واحدة أو أكثر في المسلك الإنجابي، شملت أمراضاً مهبلية جرثومية (43,7%) وداء المشعرات (16,5%)، وداء المبيضات الفرجي المهبلية (4,5%)، والعدوى المتدثرية (6,8%)، والسيلان (1,2%)، والزهرى الإنجابي المصلي (1,7%)، وعدوى فيروس الورم الحليمي البشري في عنق الرحم (4,9%)، والتؤلولات أو القرحة التناسلية (2,8%)، ومن بين لطاخات بابا نيكولاو الكافية التي بلغ عددها 715 لطاخة، كشفت 7 لطاخات منها وجود السرطان، وكشفت 4 منها وجود تقرحات حرشفية شديدة داخل الظهارة، وكشفت 15 منها تقرحات حرشفية منخفضة الشدة. وكانت الخوازميات السريرية ذات حساسية وقيم تنبؤية شديدة الانخفاض لعدوى عنق الرحم، ولكن كان أكثر من نصف عدد النساء الحاملات لأعراض المفزرات المهبلية الكريهة الرائحة، أو الحاملات لعلامات المفزرات المهبلية غير العادية، أو كليهما، مصابات بأمراض جرثومية أو بداء المشعرات.

الخصيصة: عموماً، كان 77% من النساء مصابات بأعراض تتم عن عداوى المسلك الإنجابي، وكان 70% منهن يحملن بيانات موضوعية على الإصابة بعدوى واحدة أو أكثر من عداوى المسلك الإنجابي. ويمكن للنساء الحاملات لأعراض أو علامات متقاة لعدوى مهبلية أن يتنفعن بالمعالجة المعيارية بالمترونيدازول.

الغرض: تحديد معدل انتشار ومظاهر عداوى المسلك الإنجابي بين النساء الريفيات في بيرو.

الطريقة: قمنا خلال عامي 1997 و 1998 بزيارة 18 منطقة ريفية تقع في المناطق الساحلية والجبلية، وفي مناطق الأدغال في بيرو. وقمنا بطرح استبيان موحد وإجراء فحوصات حوضية لعضوات في المنظمات النسائية المجتمعية؛ كما قمنا بجمع السائل المهبلية لقياس رقم الباهما (pH)، واختبار رائحة الأمين، وإجراء اختبار التلون بصبغة غرام، والفحص المجهرى، وعمل مزرعة لتحرّي المشعرة المهبلية؛ وتم أخذ عينات من عنق الرحم لتحرّي المتدثرة الحشرية، والتبثريفة البنية؛ وتم تحري فيروس الورم الحليمي البشري عن طريق مقايسة تفاعل سلسلة البوليميراز، وإجراء الاختبارات المصلية لتحرّي الزهري في الدم.

الموجودات: كان العمر الوسطي للمشاركات في الدراسة، البالغ عددهن 754 امرأة، 36,9 عاماً، وكان العدد المتوسط لشركاتهن في العلاقة الجنسية 1,7 شريك؛ وبينت النتائج أن 77% منهن كن يحملن أعراضاً تدل على الإصابة بعداوى المسلك الإنجابي؛ وأن 51% منهن أبلغن عن وجود الأعراض تلقائياً وأن 26% منهن أبلغن عن الأعراض بعد طرح أسئلة محددة عليهن. وكانت الأعراض المبلغتة تلقائياً تشمل الألم أسفل البطن (29,3%) والمفزرات المهبلية غير العادية (22,9%). وقد لوحظ في 70,4% من المشاركات عداوى

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