Revista Colombiana de Obstetricia y Ginecología Vol. 63 No. 1 • Enero-Marzo 2012 • (25-35)

ORIGINAL INVESTIGATION

THE PREVALENCE OF AND FACTORS ASSOCIATED WITH *C. TRACHOMATIS, N. GONORRHEAE, T. VAGINALIS, C. ALBICANS* INFECTION, SYPHILIS, HIV AND BACTERIAL VAGINOSIS IN FEMALES SUFFERING LOWER GENITAL TRACT INFECTION SYMPTOMS IN THREE HEALTHCARE ATTENTION SITES IN BOGOTÁ, COLOMBIA, 2010

Prevalencia y factores asociados a la infección por *C. trachomatis, N. gonorrheae, T. vaginalis, C. albicans*, sífilis, VIH y vaginosis bacteriana en mujeres con síntomas de infección vaginal en tres sitios de atención de Bogotá, Colombia, 2010

***Edith Ángel-Müller MD*[*], *Andrea Rodríguez MD, MSc (c)*[**], *Lilian M. Núñez-Forero*[***], *Luisa F. Moyano*[***], *Patricia González MSc*[***], *Elkin Osorio MD, MSc*[***], *Luz A. Díaz MD*[****], *Nelcy Rodríguez-Malagón MSc*[*****], *Ariel I. Ruiz-Parra MD MSc*[******], *Jorge E. Tolosa MD MSc*[*******], *Hernando Gaitán-Duarte MD MSc*[********]**

Received: January 13, 2012 – Accepted: March 16, 2012

ABSTRACT

Objective: Determining the prevalence and aetiology of sexually-transmitted infections and endogenous infections in women of childbearing age having lower genital tract infection symptoms and describing the pertinent risk factors.

Materials and methods: This cross-sectional study was carried out at three outpatient healthcare centres in Bogotá, Colombia. Etiologic diagnosis was made using Nugent's criteria for bacterial vaginosis, blood agar culture for Candida and wet mount for *T. vaginalis*. The In-pouch culture technique was used for *T. vaginalis,* the polymerase chain reaction for *C. trachomatis* and *N. gonorroheae* and serological tests for syphilis (RPR, TPHA) and HIV on a sample of the aforementioned population.

[*] Departamento de Obstetricia y Ginecología, Universidad Nacional de Colombia, Bogotá, Colombia. eangelm@unal.edu.co
[**] Instituto de Investigaciones Clínicas, Universidad Nacional de Colombia, Bogotá, Colombia.
[***] Secretaría de Salud de Bogotá, Colombia.
[****] Departamento de Obstetricia y Ginecología, Universidad Nacional de Colombia, Bogotá, Colombia.
[*****] Departamento de Estadística, Facultad de Ciencias, Universidad Nacional de Colombia, Bogotá, Colombia.
[******] Departamento de Obstetricia y Ginecología, Universidad Nacional de Colombia, Bogotá, Colombia. Instituto de Investigaciones Clínicas, Universidad Nacional de Colombia, Bogotá, Colombia.
[*******] Department of Obstetrics & Gynecology, Oregon Health & Science University, Portland, Oregon, USA. Global Network for Perinatal & Reproductive Health, Portland, Oregon, USA.
[********] Departamento de Obstetricia y Ginecología, Universidad Nacional de Colombia, Bogotá, Colombia. Instituto de Investigaciones Clínicas, Universidad Nacional de Colombia, Bogotá, Colombia. Global Network for Perinatal & Reproductive Health, Portland, Oregon, USA.

Results: 1,385 females were recruited in 2010. 115 (8.3%) were sex workers. An LGTI was confirmed in 731 (52.7%); 560 (40.4%) had an endogenous infection and 170 (12.3%) a sexually-transmitted infection (STI). The most frequent aetiology were bacterial vaginosis (39.6%), candidiasis (11%), *C. trachomatis* (9.7%) and *N. gonorroheae* (1.4%); Trichomona was detected by wet mount (0.8%) and culture (1.2%), as were syphilis (0.8%) and HIV (1 case). Sex workers had a higher risk of having an STI (2.0 OR; 1.2-.3 95% CI), as were younger females (28 ± 7.8 *cf* 32 ± 8.9) (p = 0.001) and alcohol users (2.6 OR; 1.4-4.5 95% CI).

Conclusions: Aetiology was identified for 52.7% of the females who consulted for lower genital tract infection symptoms; bacterial vaginosis was the most common and Chlamydia the most frequent sexually-transmitted infection. No specific aetiology was identified in almost the same number of females (47.3%), even when using gold-standard diagnostic technology for each microorganism.

Key words: Sexually-transmitted disease, cervicitis, vaginitis, bacterial vaginosis, epidemiology, risk factor.

RESUMEN

Objetivo: estimar la prevalencia y etiología de las infecciones de transmisión sexual, y de las infecciones endógenas en mujeres en edad reproductiva con síntomas de infección del tracto genital inferior sintomáticas, y describir los factores asociados.

Materiales y métodos: estudio de corte transversal en tres centros de atención en Bogotá. Se realizó el diagnóstico etiológico mediante puntaje de Nugent para vaginosis bacteriana (VB), cultivo para Candida, y frotis en fresco para trichomonas. En un subgrupo de pacientes se realizó cultivo In Pouch™ para *T. vaginalis* (TV), PCR para *C. trachomatis* (CT) y *N. gonorroheae* (NG), y pruebas serológicas para sífilis y VIH. Los factores de riesgo fueron evaluados comparando los dos grupos por medio del Odds Ratio (OR) y el intervalo de confianza del 95%.

Resultados: 1385 mujeres fueron incluidas, de ellas 115 (8,3%) eran trabajadoras sexuales. Se confirmó la presencia de alguna infección del tracto genital (ITG) en 731 (52,7%) de las mujeres; 560 (40,4%) presentaron infecciones endógenas y 170 (12,3%) infecciones de transmisión sexual (ITS). La etiología más frecuente fue la VB en 549 (39,6%), seguida por candidiasis en 153 (11%). CT fue detectada en 134 (9,7%) y NG en 19 (1,4%). TV fue detectada por frotis en fresco en 11 (0.8%) y por cultivo en 8 de 634 (1,2%), sífilis en 12 (0.8%) y VIH en 1 (0,07%). Las mujeres trabajadoras sexuales tuvieron mayor riesgo de presentar cualquier ITS (OR: 2.0; IC 95% 1,2-3.3). Las mujeres con ITS tuvieron una edad promedio de 27,9 (± 7.8), y aquellas que no tenían ITS de 31,9 (± 8,9) años. El consumo de licor con frecuencia entre diaria y semanal fue mayor en las mujeres con ITS (OR: 2.6; IC 95%: 1,4-4,5).

Conclusiones: se identificó la etiología en el 52,7% de las mujeres que consultaron por síntomas de infección del tracto genital inferior. Las infección más frecuente fue vaginosis bacteriana, y clamidia dentro de la infecciones de transmisión sexual. No se identificó ninguna etiología infecciosa específica en el 47,3% de las mujeres aun cuando se utilizó el patrón de oro diagnóstico para los diferentes microorganismos.

Palabras clave: enfermedades de transmisión sexual, cervicitis, vaginitis, vaginosis bacteriana, epidemiología, factores de riesgo.

INTRODUCTION

Sexually-transmitted infections (STI) are still (in the 21st century) a leading problem in all regions around the world. It has been estimated that 448 million new cases of STI occur around the world in 15- to 49-year-old adults every year; these are especially caused by syphilis, gonohorrea, chlamydia and trichomoniasis, without including cases of human immunodeficiency virus (HIV) and/or other STI (1). As well as STI, reproductive-aged females may come into contact with other endogenous in-

fections such as bacterial vaginosis (BV) and vaginal candidiasis (2). The US Centre for Disease Control (CDC) has calculated that 19 million new cases of STI occur in the USA every year, costing the US health system 16 billon dollars, without taking long-term consequences into account (3).

Both types of infection (endogenous or STI) are frequently manifest by symptoms such as increased vaginal secretion, pruritus, irritation, odour or pelvic pain (4, 5), these becoming frequent motives for consulting a general practitioner and/or a gynaecologist (6). The symptoms and signs of infection have been grouped into recognised clinical syndromes, assuming that different syndromes are caused by groups of specific aetiological agents and that such grouping of syndromes will lead to greater effectiveness in diagnosing and treating infection. This should ideally occur during a patient's first contact with the healthcare services, especially if there is no access to laboratory diagnosis services (7). Such syndromic management approach has been recommended by the World Health Organisation (WHO) (7), as well as by the Colombian Ministry of Health (8) and the Bogotá Local Health Service (9).

The proposed syndromes in females (10) include vaginal discharge syndrome which includes vaginitis caused by *Candida sp*, bacterial vaginosis (BV) and *Trichomonas vaginalis* (TV) and cervicitis syndrome which is mainly caused by *Neisseria gonorroheae* (NG), *Chlamydia trachomatis* (CT) and herpes simplex virus (HSV). Less frequently reported microorganisms would be *Mycoplasma hominis, Ureaplasma urealitycum* and *U. genitalium* (11). Lower abdominal pain syndrome caused by NG, CT and *Mycoplasma* (12) and anaerobic germs entering the upper genital tract (13) and genital ulcer syndrome caused by *T. pallidum*, *H. ducreyi*, *C. trachomatis*, *Klebsiella granulomatis* and HSV are also included (10).

However, using syndromic management involves some problems. Some STI, such as CT and NG infections, are frequently asymptomatic, thereby hampering an STI's diagnosis and treatment (1). On the other hand, syndromic management could lead to over-diagnosis and unnecessary treatment in situations involving low or unknown prevalence regarding the causal agents for a particular STI (14, 15, 16, 17). In fact, some management guidelines recommend complementing syndromic management with specific laboratory tests (10).

Publications about STI prevalence and that of other endogenous infections of the genital tract in Colombia and Latin-America do not give sufficient coverage (18, 19, 20, 21) as they are mostly directed towards studying HIV or have been carried out on selected populations, frequently sex workers (22, 23, 24, 25), thus limiting inferences being made regarding the base population.

As the Colombian Ministry of Health has considered developing guidelines for managing STI/GTI based on syndromic management, then GTI's aetiological prevalence must be defined more reliably, as must the germs causing the different syndromes, not just because this will serve as the base-line for determining the effect of future population interventions in this field but will also provide information for making a more rigorous evaluation of the pertinence and cost-effectiveness of using syndromic management in Colombia and other Latin-American countries.

This study was aimed at providing the most precise description possible of the prevalence of germs causing genital tract infections (GTI) in reproductive-aged females having symptoms of lower genital tract infection (LGTI), using gold-standard diagnostic tests and describing STI-associated factors.

MATERIALS AND METHODS

This was a cross-sectional study including 14-to 49-year-old women who consulted due to LGTI symptoms during 2010 at three healthcare attention centres in Bogotá. One of them is a private family planning and sexual and reproductive health institution, where patients affiliated to the Colombian social security contributory regime and

private middle-class patients are seen. The other two institutions were general public hospitals attending patients from the state-subsidised insurance scheme. Patients had to sign the pertinent informed consent form to become included in the study Exclusion criteria included having medical conditions requiring management at another attention level, being pregnant, having had a previous hysterectomy, menstruating at the time for the gynaecological exam and using systemic or local antibiotic treatment during the 7 days before the enrolment visit. A 1,400 participant sample size was calculated; this was based on 40% expected prevalence for the presence of any endogenous infection or STI (3% margin of error and 95% confidence interval). Sequential sampling was carried out. The study was approved by the Universidad Nacional de Colombia's Medicine Faculty's ethics committees and by the participating institutions' appropriate ethics committees.

Procedure

Patients attending consultation due to LGT symptoms who complied with the inclusion/exclusion criteria were included. A previously used, modified risk survey (26) was individually filled in with each patient in a private setting.

The patients were then seen by a GP who had been trained in syndromic management in line with WHO 2005 guidelines (6) and in taking samples for isolating the microorganisms being studied. Samples were taken as follows. The first sample was taken from the lateral wall of the vagina with a polyester swab and smeared on a slide for Gram staining and reading the Nugent score; this was done by two bacteriologists who had received training using the Global Network for Perinatal and Reproductive Health's atlas. The swab was preserved in a test-tube with 0.5 to 1 mL sterile isotonic saline solution at 37°C for mounting to enable microscopic visualisation of *Trichomonas*, mycotic structures (blastoconidia and pseudomycelia) and clue cells. A second sample was obtained from the contralateral wall of the vagina using a polyester swab; this was then grown in blood Agar medium for detecting and identifying Candida species. A parallel sample was taken from a subgroup of patients and grown in InPouch medium (BioMed Diagnostics, Inc., White City, Oregon, USA) for trichomona culture.

The first endocervical sample was obtained with a polyester swab for Gram stained smear for presumptive diagnosis of *Neisseria gonorrhoeae*. The second sample from the endocervix was taken using the swab as both means of preservation and transport with a CT and NG polymerase chain reaction (PCR) detection kit (Amplicor, Roche). A 5 ml blood sample was taken in the clinical laboratory for serological detection of anti-HIV antibodies and serological tests for syphilis. These samples were immediately taken from the laboratories at the three outpatient institutions where the consultation was held to the bacteriologist working on the study; she packaged the samples for the complementary and confirmatory tests which were carried out in the Bogotá District Department of Health's (SDS) Public Health Laboratory.

Nugent's criteria (27) were used as gold standard for diagnosing bacterial vaginosis; it was considered that a Nugent score higher than 7 or having more than 20% clue cells meant BV. Yeast colonies were isolated in 5% trypticase-soy broth agar (Biobacter) for diagnosing Candida, followed by automated identification of Candida species by biochemical profiling using VITEK yeast (YST) cards. Trichomoniasis was diagnosed by fresh reading of the wet mounts from all patients by optical microscope and InPouch culture in a subgroup of 634 patients.

CT and NG were detected by PCR test using a Cobas Amplicor kit (97.1% sensitivity, 98.1% specificity). Syphilis was initially diagnosed by presumptive test in sera (rapid plasma reagin (RPR) human syphilis) having 1:2 to 1:64 dilution titres, this being confirmed by *Treponema pallidum* haemagglutination assay (TPHA - human syphilis). The VIDAS HIV DUO Ultra immunoanalysis test (bioMérieux, Grenoble, France) was used for diagnosing HIV as

this led to the combined detection of anti HIV-1 immunoglobulins (M and O groups) and anti-HIV 2 and -HIV-1 p24 antigen in human sera or plasma by enzyme-linked fluorescent assay (ELFA - two immunoenzymatic reactions with final detection by fluorescence) (> 99% specificity and >95% sensitivity). The INNO-LIA HIV confirmatory assay (Innogenetics, USA) (96.7% specificity and 100% sensitivity) was used for all positive tests. All analytical tests were carried out following the protocols, procedures and recommendations regarding the inserts supplied with each kit.

The patients received medical management according to the GP's syndromic diagnosis; they were then seen 3 weeks later to check the definitive diagnosis and for complementary treatment to be prescribed if it was needed. Their partners were counselled and treated when applicable.

Age, socioeconomic strata, educational level, type of work engaged in, general Colombian health social security system affiliation, civil state, having a stable companion, alcohol consumption, taking illicit drugs, age when sexual life began, sexual tendency, number of sexual companions, condom use, presence of abnormal genital discharge as motive for the present consultation and definitive diagnosis were measured/assessed according to the aforementioned gold standard tests.

Stata software version 10.0 (College Station, Texas, USA) was used for statistical analysis. Means and standard deviations were used for summarising information regarding continuous numerical variables and percentages for nominal and ordinal variables. Overall GTI prevalence was determined as being the number of participants having GTI/number of participants. Prevalence was estimated by type of GTI and aetiology. Stratified analysis of specific prevalence dealt with whether the females reported being sex workers or not being sex workers, since these were considered to be two different population bases. The risk factors were evaluated by comparing both groups by means of odds ratio (OR) and 95% confidence interval (95% CI).

RESULTS

A total of 1,475 patients fulfilled the selection criteria between February and December 2010; 1,444 (98%) of them accepted an invitation to participate in the study. PCR for Chlamydia and gonococcus was inhibited in 59 of the 1,444 females (3.9%) on whom this test was performed. Complete confirmatory tests were thus available for 1,385 (96%)

Table 1.
Overall prevalence of genital tract infections in symptomatic females attending three healthcare institutions in Bogotá, Colombia, during 2010

Diagnosis	# cases (n=1,385)	Prevalence % (95% CI)
Bacterial vaginosis	549	39.6 (37.1-42.3)
Candidiasis	153	11.0 (9.4-12.7)
Trichomoniasis		
Wet mount	11	0.8 (0.4-1.5)
InPouch culture™	8/634	1.2 (0.5-2.3)
Chlamydial infection	134	9.7 (8.2-11.4)
Gonorrhoeal infection	19	1.4 (0.9-2.2)
Syphillis	12	0.9 (0.5-1.6)
HIV	1	0.07 (0-0.4)

participants, 115 (8.3%) of whom reported being sex workers.

At least one infection could be identified in 731 of the 1,385 participants (52.7%: 50.1-55.4 95%CI). Endogenous GTI was diagnosed in 560 females (40.4% prevalence; 37.8-43.0 95%CI) and STI in 170 females (12.3% prevalence; 10.6-14.1 95%CI). Table 1 shows the specific aetiological cause of infection. On the other hand 581 of the 731 females having infections (79.5%; 76.4-82.3 95%CI) had only one infection and 170 (23.2%; 20.2-26.5 95%CI) had two or more infections. The most frequent associations were BV and CT in 78 cases (14% vaginosis), BV and Candida in 41 (7.5%) and Candida and CT in 17 (11%). Some type of STI was found in 20.9% of patients in the sexual workers group, C. trachomatis being the more frequent aetiology. Regarding endogenous infection, BV prevalence was similar in both groups (Table 2).

The participants' average age in years was 31.3 (± 8.9); average age on beginning sexual relationships was 16,9 (± 3.07) years old. The age was lower in patients with STI. Table 3 lists the other social characteristics. Regarding risk factors, a statistically significant association with the presence of STI was found in females who reported having had occasional sexual relationships, being sex workers and weekly alcohol consumption (Table 4). There were no significant differences in STI frequency between adolescents and older than 19-year-old females in the female sex worker group and people other than sex workers No association was found with the presence of STI and condom use. Admitted condom use in all relationships was very low (less than 7%); most females reported not using one or only sometimes.

DISCUSSION

This study reports that only half of the patients who consulted regarding LGTI symptoms had an infection which could be identified, bacterial vaginosis being the most frequently found endogenous infection and chlamydial infection the most frequent sexually-transmitted one. In other words, close to 50% of the patients who consulted because of LGTI symptoms had a high possibility of not actually having an infection, such finding being extremely relevant for individual patient's healthcare attention and local and national policy-makers.

Our data is consistent with the reported prevalence in symptomatic BV females (22% to 50%); however, Candida infection prevalence in this study was less than that already reported (17% to 39%) (28).

Our study's results were consistent with regional ones; however, it should be taken into account

Table 2.
Prevalence of genital tract infections in symptomatic females in sexual and non-sexual workers in three healthcare institutions in Bogotá, Colombia, during 2010

Diagnosis	Female sex worker (n = 115)		Females other than sex workers (n = 1,266)	
	# cases	Prevalence % (95% CI)	# cases	Prevalence % (95% CI)
Bacterial vaginosis	51	44.3 (35-53)	496	39.2 (36.5-41.8)
Candidiasis	14	14.2 (7.1-19.1)	139	10.9 (9.3-12.7)
Trichomoniasis	4	3.5 (1.1-8.1)	11	0.9 (0.4-1.5)
Chlamydial infection	16	13.9 (8.4-21.1)	117	9.2 (7.7-10.9)
Gonorrhoeal infection	3	2.6 (0.6-6.9)	16	1.3 (0.7-2.0)
Syphillis	4	3.4 (1.1-8.1)	8	0.6 (0.3-1.2)
HIV	0		1	0.08 (0-0.4)

Table 3.
Socio-demographic characteristics of females suffering from symptoms of genital infection in Bogotá (Colombia) during 2010, according to whether they presented sexually-transmitted infection

Variable	ITS (n = 170)	Without ITS (n = 1,215)
Age mean – years (SD)	27.9 (7.8)	31.9 (8.9)
Socioeconomic level	No. %	No. %
Low	94 (55.3)	622 (51.2)
Medium	65 (38.2)	557 (45.8)
High	2 (1.2)	5 (0.4)
Lack of data	9 (5.3)	31 (2.6)
Educational level		
Primary	24 (14.1)	180 (14.8)
Secondary	78 (45.9)	524 (43.1)
Technical	34 (20.0)	261 (21.5)
University	34 (20.0)	250 (20.6)
Type of healthcare system		
Contributory	52 (30.6)	433 (35.6)
Private	3 (1.8)	30 (2.5)
Subsidised	75 (44.1)	562 (46.3)
None	40 (23.5)	190(15.6)
Marital status n (%)		
Single	89 (52.4)	504 (41.5)
Living with partner or married	67(39.4)	574 (47.2)
Divorced, separated, or widowed	14 (8.3)	137 (11.3)

that almost all Latin-American literature is mainly orientated towards evaluating specific infections in high-risk or vulnerable populations (23, 29, 30). Simões-Barbosa *et al.* (31), have reported evaluation by cytological criteria regarding 142,000 females who had undergone cervical-vaginal cytology in primary attention centres in Brasilia, Brazil, over a 6-year period. They reported 17% BV prevalence, 12.4% for candidiasis and 7.9% for trichomona. Tamayo *et al.*, who also used the pap smear as diagnostic method, reported 30% prevalence for BV, 5% for candidiasis and 1.4% for trichomoniasis (32). An STI prevalence study by De Codes (33) in 2000 involving 486 females from a family planning clinic, a public school and three slums in Bahia, Brazil, reported 0.5% NG prevalence, 11% CT and 2% syphilis in females attending planning consultations, such data being similar to ours. The group of students had 0.8% NG, 17.3% CT and 3.9% syphilis prevalence, whilst the group of females living in the slums had 3% NG, 12% CT and 5% for syphilis. Codes used PCR and LCR on urine for detecting DNA from CT and NG and for non-treponaemal syphillis screening test confirmed by treponaemal test. It is worth stressing that the adolescent population (34) and having a low socioeconomic level (35) have been described as being high-risk populations for STI. These results were partially consistent with our previous findings in 131 women (27% sexual workers), where 46% BV and 16% Candida prevalence were found. Regarding STI, syphilis prevalence was 7%, C. *trachomatis* 6% whilst N *gonorrhoeae* was not identified (26). The differences could have been based on different population base and small sample size

Regarding specific high-risk populations, Soto *et al.* (20), reported 9.6% syphillis prevalence, 20% CT, 8% NG, 8% TV and 54% BV in a sentinel STI study involving 5 central-American countries and a total of 2,466 sex workers studied between 2001 and 2002 using gold standard diagnosis methods similar to ours; the frequencies reported by Soto were greater than those reported by our group regarding female sex workers. Alvis *et al.* (36), studied STI prevalence in 69 female sex workers and 16 housewives in Montería, Colombia, using fresh smears, Gram staining and DNA detection for NG and CT with the Amplicor test, reporting 17.4% prevalence for *Gardnerella vaginalis*, 5.9% for CT, 4.3% for NG and 2.9% for TV and *Candida albicans*. Regarding the low-risk population, 56.3% was found for *Gardnerella vaginalis*, 12.5% for CT,

Table 4.
Risk factors for females having low symptoms of genital infection in patients with and without STI, Bogotá (Colombia), 2010

Variable	STI n (%)	Without STI n (%)	OR (95%CI)
Sex worker			
Yes	24 (14.1)	91 (7.5)	2.0 (1.2-3.4)
No	146 (85.8)	1120 (92.5)	
Stable couple			
Yes	131 (77.1)	944 (77.9)	
No	39 (22.9)	268 (22.1)	1.1 (0.7-1.6)
Sexual orientation			
Heterosexual	166 (97.7)	1194 (98.5)	
Bisexual/homosexual	4 (2.4)	18 (1.5)	1.6 (0.4-4.9)
Occasional couple			
No	101 (69.2)	861 (76.9)	
Yes	45 (30.8)	259 (23.1)	1.5 (1.0-2.2)
Alcohol consumption			
Never	59 (34.7)	483 (39.9)	
Daily to weekly	23 (13.5)	73 (6.0)	2.6 (1.4-4.5)
Fortnightly, monthly and/or other	88 (51.8)	656 (53.5)	1.1 (0.8-1.6)
Consuming illicit drugs			
Never	163 (95.9)	1184 (97.7)	
Daily to weekly	3 (1.8)	11 (0.9)	2.0 (0.4-7.6)
Fortnightly, monthly and/or other	4 (2.4)	17 (1.4)	1.7 (0.4-5.3)
Condom use with partner			
Always	11 (6.5)	84 (7.0)	
Never	82 (48.2)	615 (50.9)	1.0 (0.5-2.2)
Sometimes	38 (22.4)	242 (20.0)	1.2 (0.6-2.7)
Not applicable	39 (22.9)	268 (22.2)	

6.3% for NG and 12.5% for *C. albicans*. A notable feature of this study was that STI rates were greater in low-risk females. Rodrígues Baldim *et al.* (22), reported 20.5% CT prevalence, 4.0% for syphillis and 3.0% for TV in 102 female sex workers in São Paulo, Brazil.

Regarding possible associations between different infections, Yoshimura *et al.* (37), reported that bacterial vaginosis patients had a greater perception of infection with CT (26%) than females without BV (9%) and that females with CT, NT and TV infections had a high frequency of BV, meaning that it

must be considered that such patients have a greater risk of cervicitis, mainly caused by *C. trachomatis.*

The very low (< 7%) use of condoms could be explained by the high percentage of our participants who reported that they were in a stable relationship (77.1% and 77.9%). Given that condoms reduce STI, educational and public health campaigns should be conducted for increase the adequate use of Condom

The strengths of this study lay in the use of gold-standard diagnostic methods, such as PCR for chlamydia and gonococcus, and the Nugent score for BV. These methods reduced the risk of misclassification bias (low false-negative and false-positive rates). It also had low selection bias risk as non-responder rate was close to 2%.

The results obtained using the InPouch culture technique suggested that trichomona infection prevalence could have been underestimated as such culture was not used for all the patients in the study. Future studies will also need to test for microorganisms, such as mycoplasma and ureaplasma, which could cause cervicitis, and for the human papilloma virus and human herpes simplex (10).

CONCLUSIONS

Half of the patients consulting due to symptoms related to lower genital tract infection had an infection which could be identified, bacterial vaginosis being the most frequent endogenous infection and chlamydial infection the most frequent sexually-transmitted one. The other half of the patients consulting due to having symptoms of LGTI had a high probability of actually having no infection. Although this information is useful in helping to characterise LGTI infectious aetiology prevalence, it points to the need to broaden the types of diagnostic tests needed to better and correctly diagnose a LGTI in symptomatic women. Other, non-infectious causes for lower genital tract symptoms need to be considered and studied as they might explain a large percentage of cases attending consultation.

REFERENCES

1. World Health Organization. Sexually transmitted infections. Fact sheet August 2011. Available at: http://www.who.int/mediacentre/factsheets/fs110/en/. Consulted on 11th November 2011.
2. Ilkit M, Guzel AB. The epidemiology, pathogenesis, and diagnosis of vulvovaginal candidosis: a mycological perspective. Crit Rev Microbiol 2011;37:250-61.
3. CDC, Data and Statistics. Trends in sexually transmitted diseases in the United States: 2009 national data for gonorrhea, chlamydia and syphilis. Consulted on 30th December 2011. Available at: http://www.cdc.gov/nchhstp/newsroom/docs/2009STDSurvReportMediaFactSheet.pdf
4. European STD Guidelines 2001. European Branch of the International Union against Sexually Transmitted Infections and the European Office of the World Health Organization. Int J STD HIV 2001:12 Suppl 3.
5. Eckert LO. Acute vulvovaginitis. NEJM 2006;355: 1244-52.
6. Owen MK, Clenney TL. Management of vaginitis. Am Fam Physician 2004;70:2125-32, 39-40.
7. World Health Organization. Guidelines for the management of sexually transmitted infections. 2005 Available at: http://www.who.int/hiv/pub/sti/pub6/en/ Consulted on11th November 2011.
8. República de Colombia. Ministerio de Salud. Dirección General de Promoción y Prevención. Normas técnicas y guías de atención. Agreement 117/98, Resolution 412/2000.
9. Síndrome de Enfermedades de Transmisión Sexual, Guía de Manejo. Secretaría Distrital de Salud de Bogotá. Available at: http://190.25.230.149:8080/dspace/bitstream/123456789/533/1/ sindrome%20de%20enfermedades%20de%20transmision%20sexual.pdf. Consulted on 29th de December 2011.
10. Public Health Agency of Canada. Syndromic management of sexually transmitted infections. Canadian Guidelines on Sexual Transmitted Infections. 2010. Available atAvailable athttp://www.phac-aspc.gc.ca/std-mts/sti-its/Consulted on 29th November 2011.
11. Groetsch S, Keck JW. Cervicitis. Clin Fam Pract 2005;7:43-56.

12. McGowin CL, Anderson-Smits C. Mycoplasma genitalium: an emerging cause of sexually transmitted disease in women. PLoS Pathog. 2011;7:e1001324.

13. Gaitán H, Angel E, Diaz R, Parada A, Sanchez L, Vargas C. Accuracy of five different diagnostic techniques in mild-to-moderate pelvic inflammatory disease. Infect Dis Obstet Gynecol 2002;10:171-80.

14. Dallabetta GA, Gerbase AC, Holmes KK. Problems, solutions, and challenges in syndromic management of sexually transmitted diseases. Sex Transm Infect 1998;74:S1-S11.

15. Redwood-Campbell L, Plumb J. The syndromic approach to treatment of sexually transmitted diseases in low-income countries: issues, challenges, and future directions. J Obstet Gynaecol Can 2002;24:417-24.

16. Pettifor A, Walsh J, Wilkins V, Raghunathan P. How effective is syndromic management of STDs?: A review of current studies. Sex Transm Dis 2000;27:371-85.

17. Trollope-Kumar K, Guyatt G. Syndromic approach for treatment of STIs: time for a change. Lancet 2006;367:1380-1.

18. Gerbase AC, Toscano C, Titan S, Cuchí P, González-Salvatierra R, Zacarías F. Sexually transmitted diseases in Latin America and the Caribbean. Rev Panam Salud Pública 1999;6:362-70.

19. H, Lourenço A, Bodenmann P, Epiney M, Uny M, et al. Chlamydia trachomatis prevalence in undocumented migrants undergoing voluntary termination of pregnancy: a prospective cohort study. BMC Public Health. 2008Nov24;8:391.

20. Soto RJ, Ghee AE, Nunez CA, Mayorga R, Tapia KA, Astete SG, Sentinel surveillance of sexually transmitted infections/HIV and risk behaviors in vulnerable populations in 5 Central American countries. J Acquir Immune Defic Syndr. 2007;46:101-11.

21. Zavaleta C, Fernández C, Konda K, Valderrama Y, Vermund SH, Gotuzzo E. High prevalence of HIV and syphilis in a remote native community of the Peruvian Amazon. Am J Trop Med Hyg 2007;76:703-5.

22. Rodrigues M, Guimarães MC, Garcia de Lima CM. Prevalence of sexually transmitted diseases in female sex workers in a city in the interior of São Paulo, Brazil Rev. Latino-Am Enfermagem 2011;19:493-9.

23. Camejo M, Díaz M. Prevalencia de hepatitis B, hepatitis C y sífilis en trabajadoras sexuales de Venezuela / Prevalence of hepatitis B, hepatitis C and syphilis in female sex workers in Venezuela. Rev Saúde Pública 2003;37:339-344.

24. Fernández J, Martinez A, Castillon R, Tamariz J . Vaginosis bacteriana en trabajadoras sexuales que acuden a un centro especializado de referencia de enfermedades de transmisión sexual y SIDA. Rev Med Hered 2010;21:32-8.

25. Alvarado E, García A, Castruita DE, Cardosa FJ, Ruiz R. Prevalencia de infección por Chlamydia trachomatis en prostitutas registradas de la ciudad de Durango, México. Salud Pública Méx 2000;42:43-7.

26. Ángel-Müller E, González MP, Núñez L, et al. Frecuencia de infecciones del tracto genital femenino en mujeres sintomáticas y uso de pruebas rápidas para su diagnóstico en dos poblaciones de Bogotá (Colombia) 2008. Rev Colomb Obstet Ginecol 2010;61:220-30.

27. Money D. The laboratory diagnosis of bacterial vaginosis. Can J Infect Dis Med Microbiol 2005;16:77-9.

28. Nyirjesy P. Vulvovaginal candidiasis and bacterial vaginosis. Infect Dis Clin N Am 2008;22:637-52.

29. Pinzón-Rondón AM, Ross TW, Botero JC, Baquero-Umaña M. Prevalencia y factores asociados a enfermedades de transmisión sexual en menores explotados sexualmente en Bogotá, Colombia. Rev Salud Pública 2009;11:468-79.

30. Hernández-Girón C, Cruz-Valdez A, Juárez L, Hernández-Avila M. Prevalencia y factores de riesgo asociados a sífilis en mujeres. Rev Saúde Pública 1998;32:579-86.

31. Simões-Barbosa A, Coutinho G, da Silva JX, Rama II, and Paes TW. A six-year follow-up survey of sexually transmitted diseases in Brasilia, the Capital of Brazil. Braz J Infect Dis 2002;6:110-7.

32. Tamayo LS, Guevara E, López MI. Vaginosis bacteriana, cándida y tricomonas por citología cervico-vaginal en mujeres del régimen subsidiado, Medellín Colombia, 2008. Revista Salud Pública Medellín 2009:4:87-99.

33. De Codes JS, Cohen DA, Almeida de Melo N, Gonzaga G, dos Santos A, Silva T, et al. Detecção de doenças sexualmente transmissíveis em ambientes clínicos e não clínicos na Cidade de Salvador, Bahia, Brasil Cad. Saúde Pública Rio de Janeiro 2006;22:325-34.

34. Berlan ED, Holland-Hall C. Sexually transmitted infections in adolescents: advances in epidemiology, screening, and diagnosis. Adolesc Med State Art Rev. 2010;21:332-46.

35. Nahmias SB, Nahmias D. Society, sex, and STIs: human behavior and the evolution of sexually transmitted diseases and their agents. Ann N Y Acad Sci 2011;1230:59-73.

36. Alvis N, Mattar S, García J, Conde E y Díaz A. Infecciones de transmisión sexual en un grupo de alto riesgo de la ciudad de Montería, Colombia. Rev Salud Pública 2007;9:86-96.

37. Yoshimura K, Yoshimura M, Kobayashi T, Kubo T, Hachisuga T, Kashimura M. Can bacterial vaginosis help to find sexually transmitted diseases, especially chlamydial cervicitis? Int J STD AIDS 2009;20:108-11.

Conflict of interest: none declared.

Financing: this work was funded by Colciencias (Colombia) Grant: 621 2009, the Universidad Nacional de Colombia and the Bogotá Secretariat of Health.