

A PROSPECTIVE STUDY OF GENITAL INFECTIONS IN HAMEDAN, IRAN

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Abstract. A prospective study of genital infections was conducted in a university-affiliated teaching hospital in Hamedan City, Iran. A total of 540 women were recruited and divided into two equal groups: (1) the case group with vaginitis (N=270) and (2) the asymptomatic control group (N=270). Participants were interviewed about the occurrence of any vaginal or urethral discharge. Two vaginal swabs were obtained for pH testing, KOH and wet mount examination, Gram staining and culture at the time of speculum examination. In the case group, the prevalence of candidiasis, trichomoniasis, and bacterial vaginosis was 17.2, 18.1, and 28.5%, respectively. Measurement of vaginal pH in the clinic was the single most useful clinical finding for directing empirical therapy. No single specimen was found ideal for all pathogens; a cervical swab is better for *Trichomonas vaginalis* but a vaginal swab is needed for candida and bacterial vaginosis. To achieve STD control in this and similar populations, public health programs must target asymptomatic infections.

INTRODUCTION

Vaginitis, whether infectious or not, constitutes one of the most common problems in clinical medicine, and is one of the main motives for women seeking an obstetrician or gynecologist. Bacterial vaginosis, candidiasis, and trichomoniasis are responsible for 90% of cases of infectious origin (Plourd, 1997; Adad *et al*, 2001).

Bacterial vaginosis is characterized by the substitution of the vaginal flora, normally dominated by lactobacilli, by a complex and abundant flora of strictly or optionally anaerobic bacteria that are normally found in the vagina (*Gardnerella vaginalis*, *Bacteroides* sp, *Peptostreptococcus*, *Mobiluncus* sp). Abundant foul-smelling vaginal secretions are the typical symptom of infection by *Gardnerella vaginalis* (Mardh, 1993). Recent research suggests that bacterial vaginosis, a common genital tract infection which has been linked in pregnant women to premature labor and low birthweight, may also be associated with HIV risk (Cohen *et al*, 1995; Sewankambo *et al*, 1997; Paxton *et al*, 1998).

Symptomatic *Candida albicans* infection arises when there is an excessive proliferation of this microorganism in the vaginal flora, ceasing colonization and starting to achieve outright adherence to the vaginal

cells, consequently causing infection (Plourd, 1997). The patient presents thick, fetid vaginal secretions with a granular appearance and an itchy vulva. The vagina becomes hyperemic and the vulva erythematous, and there may be excoriation and dyspareunia (Taylor *et al*, 2005).

Trichomonas vaginalis is a flagellate protozoan considered to be sexually transmissible and related to low socioeconomic levels. Typically, a patient with trichomoniasis presents intense frothy yellow-greenish vaginal discharge, irritation and pain in the vulva, perineum and thighs, and dyspareunia and dysuria (Sardana *et al*, 1994; Plourd, 1997).

Diverse studies performed to establish the frequency of the most common infectious agents for vaginitis have shown widely varying results. The indices found for *Gardnerella vaginalis* have varied between 8-75%, *Candida albicans* has presented rates between 2.2-30%, and *Trichomonas vaginalis* between 0-34% (Hart, 1993; Oyarzún *et al*, 1996).

In this paper, we documented the prevalence of the most common genital infections in the enrolled population and determined the association between laboratory evidence of infection and self-reported symptoms of discharge and dysuria.

MATERIALS AND METHODS

A prospective study of genital infections was conducted in a university-affiliated teaching hospital in Hamedan City, Iran. A total of 540 women were recruited. After providing written informed consent,

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participants were interviewed in-clinic. A detailed history was obtained. Each subject underwent general physical and pelvic examination. Respondents were asked about the occurrence of vaginitis symptoms, including vaginal or urethral discharge and frequent or painful urination, at any time within the preceding six months. Two groups were selected: the case group with vaginitis (N=270), and the asymptomatic control group (N=270). Participants were interviewed about the occurrence of vaginal or urethral discharge. Two vaginal swabs from the posterior fornix were obtained at the time of speculum examination. Vaginal discharge was collected for Gram staining, KOH mount, wet mount and in a transport medium for culture and sensitivity testing. The pH of the vagina was noted by

dipping a narrow-range pH monitor into the vaginal discharge.

A wet-mount smear was examined within 15 minutes of collection for *Trichomonas vaginalis*. A KOH mount was examined for the presence of fungal hyphae. The slide was air dried, Gram stained, and microscopically examined. Diagnosis of bacterial vaginosis was determined according to a morphological scoring system (Nugent *et al.*, 1991), based on the proportions of lactobacilli relative to gram-negative anaerobes.

Data processing and statistical analysis were performed using SPSS 10.0. The results were expressed as percentage, with significance level at 5%.

Table 1
General characteristics of the subjects.

Characteristic	Case group (n=270)	Control group (n=270)	χ^2 test
Age at marriage (%)			1.68
<15	34.4	34.4	
15-20	55.6	50.7	
>20	10.0	14.9	
Literacy (%)			10.16 ^a
Educated	67.9	75.2	
Uneducated	31.1	24.8	
No. of parity (%)			1.34
1-3	49.0	55.6	
4-6	38.9	34.3	
≥7	12.1	10.1	
Mode of delivery (%)			0.98
Normal vaginal	88.2	86.6	
Instrumental delivery	3.0	4.5	
Cesarian section	8.2	9.7	
Curettage (%)			7.45 ^a
Yes	27.0	18.5	
No	73.0	81.5	

^a Significant at 5% level.

Table 2
Prevalence of genital tract infection.

Infection	Case (n=270)		Control (n=270)		χ^2 test
	N	%	N	%	
Bacterial vaginosis	77	28.5	1	0.4	26.62 ^a
Candidiasis	47	17.2	3	1.1	
Trichomoniasis	49	18.1	2	0.7	

^a Significant at 5% level.

RESULTS

General information about the selected subjects is presented in Table 1. The majority of the women (55.6 and 50.7%), in the case and control groups, respectively, had an age range of 15-20 years at marriage. The results suggested an insignificant difference in the age distribution of women between the groups. Nearly 70% of both groups were graduates. Education was significantly different in the two income groups ($p < 0.05$). Parity status was 1-3 in 49.0 and 55.6% of case and control groups, respectively. Mode of delivery for earlier pregnancies is also presented in Table 1. The majority of women (88.2 and 86.6%) from the case and control groups, respectively, had normal vaginal delivery. A significantly higher percent of women (27.0%) from the case group had experienced curettage ($p < 0.05$).

The overall prevalence of genital tract infections was high (Table 1). In the case group, the prevalence of bacterial vaginosis, candidiasis, and trichomoniasis was 28.5, 17.2, and 18.1%, respectively. The proportion of asymptomatic infections (control group) was much lower: 0.4, 1.1, and 0.7% of subjects had been infected with bacterial vaginosis, candidiasis, and trichomoniasis, respectively, and reported no symptoms within the 6 pre-interview months. Infection rates were significantly different in the two groups ($p < 0.05$). Measurement of vaginal pH in the clinic was the single most useful clinical finding for directing empirical therapy.

The sensitivity of discharge for detecting infection with bacterial vaginosis, candidiasis, or trichomoniasis among women was 11.0, 10.5, and 10.6%, respectively. Sensitivity of dysuria for bacterial vaginosis was 11.0%, and for trichomoniasis and candidiasis 11.8 and 11.7%, respectively. Respondents were asked about the occurrence of dyspareunia and pelvic pain, but on analysis neither of these additional symptoms was found to augment the sensitivity of discharge or dysuria for any of the infections studied.

DISCUSSION

Regarding the frequencies of the different vaginal pathogens, high indices of bacterial vaginosis infection were found (28.5%) and low indices of *Candida albicans* (17.2%). These data are compatible with those in other publications. Hart (1993), studying 5,365 women independent of their clinical condition, in 1988-1991, found trichomoniasis in 1.8%, bacterial vaginosis in 13.7%, and candidiasis as the main agent in 17.6% of patients. Ray *et al* (1989), studying 100 women with vaginitis and 50 asymptomatic women, found *Trichomonas vaginalis* in 11.1%, *Candida albicans* in 30% and *Gardnerella vaginalis* in 31% of the first group, while in the second group these values were 0, 14, and 22%, respectively. Tolo and Franceschini (1997) analyzed 133 patients and found *Candida* in 26%, *Gardnerella* in 8%, and 0% for *Trichomonas*.

Adad *et al* (2001), studying the epidemiology of the 3 main causes of vaginitis in the USA and Scandinavia, observed that the frequency of *Trichomonas vaginalis* had diminished markedly in both regions over recent years. This was also observed in the present study (18.1%), raising the hypothesis that this may be a consequence of the introduction of metronidazole in medical therapeutics, and improvements in hygiene. However, in other countries, *eg*, Venezuela, the frequency of infection by *Trichomonas* remains very high, detected in 24.6% of 630 examinations made in a university hospital (Rossi and Mendoza, 1996).

Taylor *et al* (2005) reported a drop in the frequency of *Candida albicans* in the USA and a stabilization of infection by this agent in Scandinavia, while in our data, infection by *Candida* was 17.2%. It is possible that the increase is a result of the use of oral contraceptives, hormone replacement therapy, an increase in the number of immunologically compromised patients (HIV, cortical therapy), changes in sexual habits (correlation with clinical sexually transmissible diseases), and from clothing and the abusive use of antibiotics.

Table 3
Sensitivity, specificity, and positive predictive value of symptoms associated with genital tract infection.

Infection	Discharge			Dysuria		
	Sensitivity (%)	Specificity (%)	PPV (%)	Sensitivity (%)	Specificity (%)	PPV (%)
Bacterial vaginosis	11.0	90.6	51.4	11.0	88.2	45.7
Candidiasis	10.5	90.4	65.3	11.7	89.0	60.1
Trichomoniasis	10.6	90.1	29.8	11.8	88.7	29.0

Several works have identified bacterial vaginosis as the leading vaginal infection in the countries researched. In a cytology clinic in Ibadan, Nigeria, bacterial vaginosis was found in 9.8% of examinations (Konje *et al*, 1991), while in our data, the bacterial vaginosis infection rate was 17.2%.

In a laboratory in Belo Horizonte, Brazil, in which tests on private patients predominated, the frequency of infection was much lower: *Gardnerella* 14.1%, *Candida* 6.9%, and *Trichomonas* 1.1%. It is probable that these lower indices are related to the socioeconomic status of the patients (Lara *et al*, 1999).

It can be seen in the present work that bacterial vaginosis has frequently been diagnosed and followed by *Trichomonas vaginalis* and *Candida albicans*; the frequency of bacterial vaginosis (28.5%), *Trichomonas* (18.1%) and *Candida* (17.2%) was determined. This study shows the historical evolution of the laboratory service in Hamedan City, Iran, giving evidence of the diagnostic difficulties in the beginning and the changes in frequency of the different infections, which may be related to the living and hygiene habits of the population and the introduction of different medications over this period. Vaginal infections are a significant problem for women of childbearing age. Several factors play a crucial role in the pathogenesis of infection. Estimates of asymptomatic *Trichomonas vaginalis* and bacterial vaginosis among women at clinics have varied. To achieve STD control in this and similar populations, public health programs must target asymptomatic infections.

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