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Original Article

Vaginal discharge: risk assessment and predictive value of cytologic smears and culture

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Abstract

Objectives : To evaluate the risk factors associated with vaginal discharge and the predictive value of cytologic smears and cultures in its clinical diagnosis. *Methods :* This is an observational study. One hundred fifty consecutive women presenting for the first time to the Gynecology outpatient clinic of a Medical College hospital with complaints of vaginal discharge, lower abdominal pain and genital warts or ulcers were enrolled over a period of 4 months. Specimens were collected for laboratory investigation to aid in the etiological diagnosis of vaginal discharge. A risk factor assessment was performed. *Results :* Univariate analysis of selected risk factors with three vaginal infections did not show any significant association between sociodemographic indicators and the occurrence of infection. Bacterial vaginosis (BV) was the most common pathogen associated with HIV seropositivity. Using greenish yellow frothy discharge and strawberry vagina as a clinical sign for the diagnosis of trichomoniasis, the sensitivity of detection was 68.8% with PPV and NPV exceeding 90%. When curdy white discharge was used as a clinical sign for candidiasis, the sensitivity was 61.9% and specificity 99.1%. *Conclusions:* Syndromic management of vaginal discharge based on appearance and characteristics is likely to be more accurate in case of greenish yellow frothy and curdy white discharge as compared to homogeneous white discharge.

Key words : vaginal, discharge, cytology, cultures

Introduction

The management of vaginal and cervical infections is difficult in developing countries because laboratory facilities for diagnosing these infections are rarely available. Trichomoniasis is less common in affluent countries but reaches high levels (often 10-20%) among poor women in developing countries as well as among disadvantaged women in affluent countries[1]. Although vulvovaginal candidiasis and bacterial vaginosis often develop independent of sexual activity, trichomoniasis is mainly sexually transmitted and has been ranked by the World Health Organization (WHO) as the most prevalent nonviral sexually transmitted infections (STI) in the world, with an estimated 172 million new cases a year[2]. Epidemiologically, T vaginalis infections are commonly associated with other STIs and may be a particularly sensitive marker of high risk sexual behavior, including HIV.

This study was undertaken to assess the microbial etiology of vaginal discharge, its risk factor associations

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and the predictive value of cytologic smears and cultures in the clinical diagnosis of vaginal discharge.

Materials and Methods

This study was carried out in the Gynecology Outpatients Department in New Civil Hospital and Government Medical College Surat from 1st March to 30th June 2005. One hundred fifty women attending the outpatient clinic for the first time with complaints of vaginal discharge, lower abdominal pain, genital warts or ulcers were consecutively enrolled.

The women were interviewed. Informed consent was taken. Permission was obtained from the Institutional Ethics committee of Government Medical College, Surat to proceed with the study. The participants answered a structured questionnaire, which included data on socio-demographic characteristics, medical history, sexual behavior, reproductive history and relevant past and family history.

Examination included a speculum and bimanual examination. The speculum examination noted the presence and color of discharge as well as any inflammation causing increased redness of the cervix, mucopus, bleeding or friability. Vaginal and cervical specimens were collected during pelvic examination for laboratory investigation to establish the etiological diagnosis. Later a bimanual examination was performed. Vaginitis was defined as the presence of abnormal vaginal discharge. Examination was performed in all cases by the second author who was a third year resident at the time of the study.

Laboratory Testing

All the 150 women underwent laboratory tests. These tests were performed in the Department of Microbiology, Government Medical College, Surat. Trichomoniasis (TV) was detected by the presence of green yellow frothy discharge and strawberry vagina on clinical examination. High vaginal swab was collected from posterior fornix and inoculated in Feinberg-Whittington's culture medium. In the laboratory, the media was incubated at 37^{0}C and examined on alternate days for up to 7 days for presence of motile trichomonads. In the clinic (outpatient department), the diagnosis was made by wet mount for motility by the second author.

Candidiasis was detected clinically by the presence of curdy white discharge and in the laboratory by Gram stain and culture on Sabouraud's agar from a swab taken from the posterior fornix.

Bacterial vaginosis (BV) was detected by the presence of a homogeneous white discharge on speculum examination and by Gram's stain of the vaginal discharge for the presence of gardnerella morphotypes characteristic of BV. Vaginal exudate was collected with a sterile swab from the posterior fornix. Culture for BV was not possible due to infrastructural constraints.

Serological tests were performed for other reproductive tract infections like HIV, Hepatitis B, Syphilis, HSV-1 and 2 and gonorrhea.

Serological tests:

1. HIV-1 and HIV-2 (Comb Aids-RS, Span Diagnostics Ltd., India) if positive, repeat rapid test was done (TRIDOT ELISA, J. Mitra & Company Ltd., India) and confirmed by ELISA (HIVASE 1+2, General Biologicals Corp., Taiwan).
2. Hepatitis-B Virus (HBV): Hepatitis-B one-step strip test (Lab Care Diagnostics, India).
3. Syphilis: Rapid Plasma Reagin Test (Tulip Diagnostics India).
4. Herpes Simplex Virus 1 and 2 (HSV-1 and HSV-2): ELISA (EIAgen herpes simplex virus 1 and 2 IgM kit, Adaltis Italia SPA, Italy).
5. Gonorrhea was detected by Gram stain from endocervical swab as gram negative intracellular diplococci in polymorphonuclear leucocytes (PMN) and followed by culture on Thayer-Martin medium.

It was not possible to include Chlamydia testing in this spectrum due to resource constraints.

Treatment for vaginal discharge was given as per hospital protocols based on the clinical diagnosis. Treatment was later modified if the etiological diagnosis was different from the initial clinical diagnosis.

Statistical Analysis

The data was serially entered in EPI-6 and Odd's ratios with 95% confidence intervals and two-tailed p values were calculated. A p value of < 0.05 was considered statistically significant. Sensitivity, specificity, positive and negative predictive values were used.

Results

The mean age of the patients was 27.378 ± 5.52 years. Majority of them (n=133, 88.7%) were housewives, 143 (95.3%) were currently married and 130 (89%) of the husbands were employed as unskilled laborers. No subject tested positive for HSV-1 and gonorrhea in this study.

Table 1 shows the univariate analysis between selected risk factors and trichomoniasis. In this study, 16 subjects (10.9%) had vaginal trichomoniasis (TV). No statistically significant association was found between level of education, current use of contraception and history of blood transfusion. None of the subjects was positive for HIV. Bacterial vaginosis (BV) was found in 3 women and 2 of them tested positive for HSV-2.

Table 2 shows univariate analysis between selected risk factors and candidiasis. In this study, 27 subjects (18.4%) had candidiasis. No statistically significant association was found between education, contraception and blood transfusion. Of the 7 HIV positive women, 1 had candidiasis.

Table 3 shows univariate analysis of selected risk factors with BV. BV was identified in 36 subjects (23.7%). No significant association was found between migrant status, education, contraception and blood transfusion. Of the 7 subjects, who were HIV positive, 3 were diagnosed to have BV with OR, 2.5 (95% CI, 0.41, 14.35) suggesting thereby, that HIV positive women are more

Table 1. Association between selected risk factors and trichomoniasis.

Risk factors	n	TV+ve	TV-ve	OR (95% CI)	'P' value
Migrant status					
Yes	6	5	57	0.61 (0.17, 2.08)	0.4
No	2	11	71		
	8				
	8				
Education:				0.54 (0.17, 1.73)	0.24
Literate	8	7	79		
Illiterate	6	9	55		
	6				
	4				
Contraception:					
Barrier	1	0	14	0.00 (0.00, 3.08)	0.17
IUCD	4	0	7	0.00 (0.0, 7.09)	0.3
	7				
Blood transfusion	4	0	4	0.00 (0.0, 14.17)	0.5
HIV	7	0	7	0.00 (0.0, 7.09)	0.3
Syphilis	4	0	4	0.0 (0.0, 14.17)	0.5
HBV	1	0	1	0.0 (0.0, 156.28)	0.7
HSV-2	3	2	33	0.44 (0.06, 2.21)	0.3
	5				
Candida	2	0	27		
	7				
Bacterial	3	3	36	0.71 (0.15, 2.93)	0.6
Vaginosis	6				

Table 2. Association between selected risk factors and candidiasis.

Risk factors	n	Candidiasis + ve	Candidiasis -ve	OR (95% CI)	'p' value
Migrant					
Yes	6	11	51	0.97 (0.38, 2.46)	0.9
No	2	16	72		
	8				
	8				
Education:					
Literate	8	17	69	1.33 (0.52, 3.45)	0.5
Illiterate	6	10	54		
	6				
	4				
Contraception :					
Barrier	1	4	10	1.97 (0.47, 7.77)	0.3
IUCD	4	2	5	1.89 (0.23, 12.14)	0.5
	7				
Blood transfusion	4	1	3	1.54 (0.0, 18.01)	0.7
HIV	7	1	6	0.75 (0.0, 6.7)	0.8
Syphilis	4	0	4	0.0 (0.0, 7.37)	0.3
HBV	1	0	1	0.0 (0.0, 82.3)	0.6
HSV-2	3	5	30	0.7 (0.21, 2.22)	0.5
	5				
Trichomoniasis	1	0	16		
	6				
Bacterial vaginosis	3	2	34	0.21 (0.3, 1.0)	0.025
	6				

Table 3. Association between selected risk factors and BV.

Risk factors	n	BV +ve	BV-ve	OR (95% CI)	'p' value
Migrant					
Yes	6	16	46	1.18 (0.51, 2.71)	0.66
No	2	20	68		
	8				
	8				
Education:					
Literate	8	17	69	0.58 (0.25, 1.33)	0.15
Illiterate	6	19	45		
	6				
	4				
Contraception:					
Barrier	1	2	12	0.5 (0.07, 2.58)	0.37
IUCD	4	2	1	1.28 (0.16, 8.08)	0.77
	7				
Blood transfusion	4	1	3	1.06 (0.0, 12.18)	0.1
HIV	7	3	4	2.5 (0.41, 14.35)	0.23
Syphilis	4	0	4	0.0 (0.0, 5.04)	0.25
HSV-2	3	7	28	0.74 (0.26, 2.04)	0.5
	5				
HBV	1	0	1	0.0 (0.0, 57.19)	0.6
Trichomoniasis	1	3	13	0.71 (0.15, 2.93)	0.6
	6				
Candidiasis	2	2	25	0.21 (0.03, 1.0)	0.025

likely to have BV than those who are HIV negative. However, this association was not statistically significant. BV was found to coexist with trichomoniasis and candidiasis in 3 and 2 subjects respectively.

Table 4 shows the correlation of curdy white discharge (CWD), homogeneous white discharge (HWD) and green yellow frothy (GYF) discharge with the lab diagnosis. The sensitivity of CWD to detect candidiasis was 69.1% and the specificity was 99.1%. Thus using CWD as clinical sign for candidiasis, almost all negative cases (normal cases) will be detected. Positive predictive value (PPV) of this sign was 96.3% and negative predictive value (NPV) was 87.0%. Sensitivity of GYF discharge to detect trichomoniasis was 68.8% and specificity was 99%, PPV was 91.7% and NPV was 96.4%.

Table 4. Predictive value of curdy white discharge (CWD), green yellow frothy discharge (GYF) and homogeneous white discharge (HWD).

Clinical sign	Sensitivity 95%)	Specificity 95%)	PPV 95%)	NPV 95%)	Lab test
GYF	68.8%	99.3%	91.7%	96.4%	Wet mount
discharge + SV	(41.5, 87.9)	(95.3, 100)	(59.8, 91.6)	(91.3, 98.7)	
CWD	61.9%	99.1%	96.3%	87%	Gram stain
	(45.6, 76.0)	(94.2, 100)	(79.1, 99.2)	(79.4, 92.2)	
HWD	69.3%	84.2%	58.1%	89.7%	Gram stain
	(51.4, 83.1)	(75.9, 90.1)	(42.2, 72.6)	(82.0, 94.5)	

The sensitivity of the homogeneous white discharge to detect infection of BV was 69.4% but the specificity was higher (84.2%). The PPV of HWD to find a positive case was 58.1% while NPV was 89.7%.

Discussion

This study was undertaken to assess the microbial etiology of vaginal discharge, its risk factor associations and the predictive value of cytologic smears and cultures in the clinical diagnosis of vaginal discharge. The PPV was best for greenish yellow frothy discharge and curdy white discharge as clinical signs and least for homogeneous white discharge. The implications of these findings are on the use of syndromic management of vaginal discharge based on initial clinical diagnosis in resource constrained settings.

In this study it was not possible to include chlamydia testing due to resource constraints. This is a major limitation of the study. Also this study was undertaken with a definite time frame in mind and therefore formal sample size calculation was not performed and 150 consecutive subjects were enrolled instead.

BV was the most common vaginal infection identified (n=36, 23.7%). It was also the most common vaginal infection associated with HIV seropositivity (3/7 subjects). Diagnosis of BV was based on a direct gram stained smear of vaginal discharge as culture was not possible due to resource constraints. Rotimi et al[3] found that the semi quantitative assessment of gardnerella morphotypes was found to correlate positively with the semi-quantitative assessment of G. vaginalis growth by culture ($p<0.0001$). Amsel's criteria were not preferred due to its poor predictive value[4]. Several studies have found association between HIV seropositivity and BV[5-7].

In our study, no risk association was found between vaginal discharge and selected demographic and historical factors. One possible reason for this is that we have not been able to elicit history regarding common risk variables linked to sexual behavior. Risk assessment based on questions of sexual behavior to identify women with a possible STI, do not work in a population where the social sanctions against women who have sex outside of marriage are high, and very few women are likely to report extramarital or premarital sexual activity[8,9].

In a study based in Thailand, Chandeying et al[10] found the sensitivities and specificities of various indicators as follows: curdlike vaginal discharge for candidiasis, 72% and 100%; homogenous vaginal discharge for bacterial vaginosis or trichomoniasis, 94% and 88% respectively; absent or scanty lactobacilli for bacterial vaginosis, 99% and 68%; and with > 20% clue cells for bacterial vaginosis, the figures were 81% and 99% respectively. This study found better predictive values for homogeneous white discharge for BV as compared to our study.

Studies have found different accuracies for syndromic management of various types of vaginal discharge in different settings. Vishwanath et al[11], using the algorithm

by NACO (National AIDS Control Organization) for the management of vaginal discharge, found that the sensitivity of syndromic approach algorithm had a low sensitivity for candidiasis and cervical discharge leading to overtreatment and erroneous labeling of women as having STI. However, it was useful in women where the vaginal discharge was suggestive of BV or trichomoniasis. Hawkes et al[8] using the WHO (World Health Organization) Risk Assessment Algorithm, found a high sensitivity and low specificity for BV, candidiasis and trichomoniasis. Their analysis of two algorithms shows that neither deals adequately with the management of STIs. No woman with cervical STI was correctly diagnosed by health care workers. Our results however indicate that if a syndromic approach is to be used by a person with training and experience equivalent to that of a third year resident in obstetrics and gynecology, it would be possible to use greenish yellow frothy discharge and curdy white discharge as reasonably accurate indicators of trichomoniasis and candidiasis respectively. However, to consider homogeneous white discharge as indicator for BV is likely to be less accurate.

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