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Original Article

The risk assessment and predictive value of cytological smear and culture of vaginal discharge in reproductive age group women

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Abstract

Objective To determine the various causes of vaginal discharge in a tertiary care setting.

Methodology A total of 120 women presenting with vaginal discharge were subjected to cytological diagnosis and confirmed by culture.

Results Out of total 120 women with vaginal discharge, 103 (85.83%) women were found positive for the diagnosis of interest (bacterial vaginosis, candidiasis and trichomoniasis) which were more or less equally divided in the different age groups. Most common reproductive tract infection in study population was bacterial vaginosis (45.8%) followed by candidiasis (25.8%) and trichomoniasis (14.2%). Seventeen (14.2%) women were found to have vaginal discharge without any microbiological evidence.

Conclusion The pattern of infectious causes of vaginal discharge observed in our study was comparable with the other studies in India. Our study emphasizes on importance of specific type of cervical discharge in diagnosing various reproductive tract infections (RTIs). This study highlight the opportunity of simultaneous counselling and assessment of co-existing RTIs which could be present in many of the cases.

Key words
Reproductive tract infection, vaginal discharge, predictive value.

Introduction

Reproductive tract infections (RTIs) are perhaps as old as human civilization itself and vaginal discharge is one of the common reason for gynecological consultation. Approximately 40% of women with vaginal symptoms will have some type of vaginitis.[1]

Many microorganisms other than lactobacilli can be cultivated from the vaginal samples of healthy women which do not trigger a pathological state, but when one class of them dominates, the resulting imbalance precludes to vaginitis/vaginosis. The common infectious causes of vaginitis include anaerobic bacteria causing bacterial vaginosis (BV), vulvovaginal candidiasis (VVC) and trichomonal vaginitis.[1]

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Identifying the infectious source of vaginal discharge can be challenging, because a large number of pathogens cause vaginal and cervical infection and several infections may coexist. Patient's history and physical examination findings along with appropriate tests may suggest a diagnosis. Effective treatment of vaginal discharge requires that the etiologic diagnosis be established and identifying the same offers a precious input to syndromic management and provides an additional strategy for HIV prevention. This study aimed at assessing the microbial etiology of vaginal discharge, its risk factor associations and the predictive value of cytological smears and cultures in the clinical diagnosis of vaginal discharge.

Methods

This hospital-based, observational, cross-sectional study was done on 120 patients with vaginal discharge, who attended the Obstetrics and Gynecology outpatient department of Indira Gandhi Government Medical College, Nagpur from December 2010 to September 2013. All reproductive age group females complaining of vaginal discharge (15-45 years) were included in the study irrespective of marital status. Women not in reproductive age group (less than 14 years and more than 45 years of age), who had used antibiotics or vaginal medication in the previous 14 days, and pregnant women were excluded from the study. After obtaining the clearance from institutional ethical committee and informed consent of patients, detailed history was taken regarding presenting symptoms like vaginal discharge including its character, colour, associated symptoms like dysuria, dyspareunia and increased frequency of micturition. Additional factors like age of marriage, migrant status, education, use of contraception, parity, and socioeconomic status were also interviewed. Past history regarding diabetes mellitus, thyroid diseases, ingestion of broad-spectrum antibiotics in recent past, history of sexual behavior, immunocompromised status was enquired. A detailed obstetric history was also obtained.

The amount, odor, color and consistency of vaginal discharge were noted. The discharge was labeled scanty if it was insufficient to collect on the speculum; moderate if it was sufficient to collect on the speculum and profuse if it was visible at the introitus even before speculum insertion. The vaginal pH measured directly using pH indicator strips against the lateral vaginal wall.

A sterile cotton swab was used to collect the vaginal discharge from the posterior vaginal fornix under direct vision and the specimen thus obtained was subjected to a series of laboratory tests. However, in virgin females, the specimen was obtained from the introitus. A bimanual examination was done in all except virgins to look for adnexal tenderness. All the 120 women underwent laboratory tests. These tests were performed in the Department of Microbiology of the Medical College. Following laboratory investigations were done:

1. Fasting and postprandial blood sugar levels.
2. HIV ELISA – (TRIDOT ELISA, J. Mitra & Company®, India).
3. HBsAg - (Lab Care Diagnostics, India).
4. VDRL / rapid plasma reagin test (TulipDiagnostics®, India).
5. TPHA: TPHA test kit (Plasmatec®).
6. Microscopy – saline wet mount for motile trichomonads, gram staining and KOH mount of smears were done (and same was whiffed for presence of fishy odor). All the vaginal smears were processed within 20 minutes after liaising with the microbiology department.
7. Cultures- The positive smears of candida were confirmed after inoculating the

specimen on appropriate media (Sabouraud's agar). For *Trichomonas vaginalis* culture sample was inoculated directly and swirled into the Kupferberg medium (Himedia Labs®, Mumbai, India). The culture tubes with 5 ml of the broth were incubated in anaerobic atmosphere at 35°C.

It was not possible to include chlamydia and gonorrhea testing in this spectrum due to resource constraints.

The diagnosis criteria of different vaginal diseases were as follows:

1. *Trichomoniasis*[2]:

- Wet mount: Pear-shaped organisms approximately the same size as that of a lymphocyte (10-20 μm) or that of a small neutrophil with characteristic jerky movements.
- Culture: Diagnosis was made by performing wet mounts for evidence of motile trichomonads by examining cultures after 24 h of incubation and then daily for up to 7 days. For culture, Kupferberg medium (Himedia Labs®, Mumbai, India) with fetal calf serum was used. The culture tubes with 5 ml of broth were incubated in anaerobic atmosphere at 35°C.

2. *Bacterial vaginosis* was based on Amsel's criteria[3] in which the presence of three out of four criteria is necessary:
   - Excessive homogenous uniformly adherent vaginal discharge
   - Vaginal pH >4.5
   - Positive amine test (Whiff test) – vaginal discharge collected from the posterior fornix of vagina was swabbed onto a glass slide followed by the addition of 10% KOH. Presence of a fishy odor was taken as a positive Whiff test.
   - Presence of clue cells on microscopic examination
3. *Vulvovaginal candidiasis* was based on positive microscopy characterized by the presence of budding yeast cells and/or culture on Sabouraud's dextrose agar medium.

Statistical analysis

Data collected were tabulated in Microsoft Excel worksheet. Continuous variables like age/age of marriage were presented as mean ± SD. Categorical variables were expressed in actual numbers and in percentage and were compared by performing chi square test. For statistics for small numbers, Fisher's exact test was applied wherever applicable. Odd ratio and 95% CI were calculated to find association of RTI and various types of RTI. Sensitivity, specificity, positive predictive value, and negative predictive value estimated to correlate clinical features and diagnosis of RTI.

Results

Out of total 120 patients, 103 (85.83%) patients were found positive for the diagnosis of interest (BV, VVC and trichomoniasis). All the cases of RTI were more or less equally divided in the different age groups with highest prevalence (95.2%) being in the age group of 41-45 years.

Most common RTI in study population was BV (45.8%) followed by VVC (25.8%) and trichomoniasis (14.2%). Out of all women, 17 (14.2%) women were found to have vaginal discharge without any microbiological evidence.

The mean ages of occurrence of BV, VVC and trichomoniasis were 27±5.71, 32.33±7.63 and 33.88±6.82 years, respectively concluding

Table 1 Age distribution of reproductive tract infections in the study population (N=120).

Age (years)	*No.*	*Positive**	*% Prevalence*
15-20	7	6	85.7
21-25	28	23	82.1
26-30	25	20	80.0
31-35	21	18	85.7
36-40	18	16	88.9
41-45	21	20	95.2
Total	120	103	85.8

*Patients who were found positive for the diagnosis of interest (BV, VVC and trichomoniasis).

Table 2 Prevalence of reproductive tract infections (RTIs) in the study population (n=120).

RTI	*Prevalence*	*% Prevalence*
Bacterial vaginosis	55	45.8
VVC	31	25.8
Trichomoniasis	17	14.2
No microbiologic diagnosis possible	17	14.2

VVC = vulvovaginal candidiasis

Table 3 Mean age of occurrence and marriage of each reproductive tract infection (RTI).

RTI	Age (years)	Mean age of marriage (years)
Bacterial vaginosis	27±5.71	20.33±1.87
Candidiasis	32.33±7.63	21.2±2.18
Trichomoniasis	33.88±6.82	21.06±2.84

occurrence of BV in comparatively younger age group in our study.The mean ages of marriage of patients having BV, VVC, and trichomoniasis were 20.33±1.87 years, 21.2 (±2.18) years and 21.06 (± 2.84) years, respectively.

Socio-demographic characteristics Majority (73, 60.8%) of our patients belonged to the upper lower socio-economic class (Class IV) as per Kuppuswamy's socio-economic status scale-updating for 2012. Most (111, 92.5%) of these women were married and 9 (7.5%) of them were unmarried.

While evaluating education as a risk factor, we did not find any significant difference in occurrence of RTIs among literate and illiterate, *p* value for BV, VVC and trichomoniasis were 0.7825, 0.1936 and 0.4322, respectively. We did find that occurrence of RTIs were more in migrant people with *p* value for BV,VVC and trichomoniasis is being 0.012, 0.009 and 0.032 respectively.

Co-existent sexually transmitted infections and HBV Out of 120 patients, 7 patients were positive for HIV ELISA, out of which 3 had VVC, 1 had BV and 3 had trichomoniasis. Six patients were found positive for syphilis, out of which 2 had VVC, 1 had BV and 2 had trichomoniasis. HBV was found positive in 6 patients out of which 3 had VVC and 1 had trichomoniasis.

Out of the 120 women with vaginal discharge in our study, the most common associated symptom was vulvar itching (70%). Other symptoms were dysuria (45.8%), increased frequency of micturition (25.8%) and dyspareunia (16.7%).

Maximum number of patients with BV had a complaint of foul-smelling discharge (80%) while in cases of VVC, vulvar itching (83.9%) was the most common symptom.

Discussion

Among the 120 women presenting to the Obstetrics and Gynecology outpatient department with complaints of vaginal discharge, 103 (85.8%) women were found to have anyone of the RTI of interest of study with BV being the commonest (55, 45.8%) followed by VVC (31, 25.8%) and trichomoniasis (17, 14.2%). This was comparable to the observations made by Patel *et al*.[4] in their population-based study on 2494 women of reproductive age group in Goa in which BV and VVC were observed in 17.8% and 8.5% cases, respectively. Similarly, in a population-based

Table 4 Prevalence of clinical features in different RTIs in our study population (n=120).

Symptoms	*Bacterial vaginosis (n=53) P (% P)*	*Vulvovaginal Candidiasis (n=31) P (% P)*	*Trichomoniasis (n=17) P (% P)*	*Unclassified vaginal discharge (n=17) P (%P)*
Foul smelling discharge	44 (80%)	21 (67.7%)	11 (64.7%)	0
Vulvar itching	34 (61.8%)	26 (83.9%)	15 (88.2%)	9 (52.9%)
Dysuria	19 (34.6%)	20 (64.5%)	10 (58.8%)	6 (35.3%)
Increased frequency of micturition	13 (23.6%)	9 (29.0%)	5 (29.4%)	4 (23.5%)
Dyspareunia	11 (20%)	6 (19.4%)	1 (5.9)	2 (11.7%)

Table 5 Predictive value of homogeneous white discharge, curdy white discharge, and green yellow frothy discharge.

Character of discharge	*Sensitivity*	*Specificity*	*Positive predictive value*	*Negative predictive value*	*Lab test*
Homogeneous white discharge	69.09	81.53	76	75.71	Gram stain
Curdy white discharge	70.97	98.87	95.65	90.72	KOH mount
Green yellow frothy discharge	76.47	97.08	81.25	96.5	Wet mount

study from both rural and urban communities by Bhalla *et al*.[5] on women in reproductive age group, the most common infection was BV (32.8%), followed by VVC (16.9%) and trichomoniasis (2.8%). A study performed by Puri *et al*.[6] on 100 sexually active women presenting with vaginal discharge revealed BV, VVC, trichomoniasis and nonspecific urogenital causes in 45%, 31%, 2% and 5% of cases, respectively. The spectrum of vaginal discharge, similar to that seen in our study was observed by Vishwanath *et al*.[7] in their study on symptomatic women attending reproductive health clinic in New Delhi, wherein BV was diagnosed in 26% cases, VVC in 25.4% and trichomoniasis in 10% cases. In an another study done by Sivaranjini *et al*.[8] in 400 women presenting with vaginal discharge, similar spectrum was seen with BV, VVC and trichomoniasis being 31%, 17.5% and 6.75%, respectively. The similar trends in the Indian studies may be attributed to a conservative Indian society, where premarital or extramarital sexual contact is an exception rather than the rule. Hence, BV and VVC, whose spread by sexual transmission is doubtful, are more prevalent when compared to trichomoniasis.

This was in contrast to the study done by Fonck *et al*.[9] where VVC was more prevalent (46%), followed by trichomoniasis (21% cases) and BV (10%). The higher frequency of trichomoniasis in this study was probably because the study population was recruited from major sexually transmitted infection (STI) referral clinics in Kenya. In an another study done by Dan *et al*.[10] on symptomatic women of reproductive age recruited from a gynecologic clinic in Israel, VVC was reported as the most common (35.5%) infection, followed by BV (23.5%) and trichomoniasis 8.1%.

Prevalence of RTI was almost equally distributed in all the age groups with slightly higher incidence noted in 41-45 years age group, which may be due to alkaline pH in this age group with maximum number of cases (41.8%) being in the age group of 21-30 years. Similar findings were seen in a study done by Bansal *et al*.[11] in which maximum number of cases (55.6%) of RTI were in the age group of 21-30 years showing a relation with period of high fertility.

In our study, patients with BV mainly presented with a musty or fishy vaginal odour, a thin white vaginal discharge, itching and burning sensation. Sensitivity and specificity of homogenous white

discharge predicting the diagnosis of BV were comparable with the findings of the study done by Maitra *et al*.[12], although negative predictive value was little lower in our study. Specificity (80.6%) was low indicating absence of homogenous white discharge cannot rule out BV by fairly means.

VVC mainly presented with itching, burning and curdy white discharge. Specificity and positive predictive value were comparable to study done by Maitra *et al*.[12] indicating absence of curdy white discharge almost rule out VVC while its presence almost confirms the diagnosis.

In trichomoniasis chief complaints were profuse, green-yellow frothy discharge, vaginal or vulvar irritation, vaginal odour, itching, painful intercourse and painful urination. Specificity and negative predictive value of green-yellow frothy discharge predicting the diagnosis of trichomoniasis were high and comparable with Maitra *et al*.[12] stating that absence of green-yellow frothy discharge almost rules out trichomoniasis.

Conclusion

The pattern of infectious causes of vaginal discharge observed in our study was comparable to most other studies in India with BV (45.8%) being the commonest followed by VVC (25.8%) and trichomoniasis (14.2%). Our study emphasizes that the curdy white discharge and green-yellow frothy discharge reasonably can be used as an accurate indicators of VVC and trichomoniasis, respectively due to their high specificity and positive predictive value. However, to consider homogenous white discharge as an indicator for BV is likely to be less accurate due to low specificity and PPV. This study also highlight the opportunity of simultaneous counselling and assessment of co-existing RTIs which could be present in many of the cases at the time of presentation.

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