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Clinical Status of Abnormal Vaginal Discharge in Women

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Abstract **Original Research Article**

Background: Abnormal vaginal discharge is a common gynecological complaint among women of reproductive age, often indicating underlying fungal, bacterial, or protozoal infections. *Candida albicans*, *Gardnerella vaginalis*, and *Trichomonas vaginalis* are primary pathogens, and timely detection is essential for effective management and prevention of complications. Self-collected vaginal swabs have emerged as a patient-friendly diagnostic alternative to physician-collected swabs. ***Objective:*** To evaluate the clinical status of abnormal vaginal discharge in women and compare the diagnostic accuracy of self-collected versus physician-collected vaginal swabs for pathogen detection. ***Methods:*** A cross-sectional descriptive study was conducted at the Department of Obstetrics and Gynaecology, Mymensingh Medical College Hospital, Bangladesh, from February 2020 to August 2021. A total of 222 women aged 15–49 years presenting with abnormal vaginal discharge were enrolled. Socio-demographic data were collected, and each participant provided two self-collected and two physician-collected vaginal swabs. Wet mount examination, Gram staining with Nugent scoring, and culture on Sabouraud's dextrose agar were performed to detect *Trichomonas vaginalis*, *Gardnerella vaginalis*, and *Candida albicans*, respectively. Statistical analysis was performed using SPSS 26.0, with $p < 0.05$ considered significant. ***Results:*** *Candida albicans* was the most prevalent pathogen (43.2%), followed by *Gardnerella vaginalis* (28.4%) and *Trichomonas vaginalis* (3.6%). No pathogenic organism was identified in 24.8% of participants. Candida and Gardnerella infections were evenly distributed across socio-demographic variables, whereas Trichomonas infection was significantly higher among women aged 15–25 years (10%; $p = 0.025$). Self-collected swabs demonstrated high concordance with physician-collected swabs, with 95.8% sensitivity and 98.4% specificity for Candida detection ($p < 0.001$). ***Conclusion:*** *Candida albicans* is the leading cause of abnormal vaginal discharge in reproductive-aged women, followed by *Gardnerella vaginalis*, while *Trichomonas vaginalis* is comparatively rare and concentrated in younger women. Self-collected vaginal swabs are highly reliable, providing a practical and patient-friendly alternative to physician-collected samples, potentially improving early detection and access to care in community and resource-limited settings.

Keywords: Abnormal vaginal discharge, *Candida albicans*, *Gardnerella vaginalis*, *Trichomonas vaginalis*.

INTRODUCTION

Abnormal vaginal discharge is one of the most frequently reported gynecological complaints among women of reproductive age, often prompting clinical evaluation. While physiological vaginal discharge varies throughout the menstrual cycle, abnormal discharge is characterized by changes in quantity, consistency, color, or odor and may be associated with symptoms such as itching, irritation, dysuria, or pelvic discomfort. The presence of abnormal discharge often indicates an underlying infection or disruption of the vaginal microbiota, which can affect reproductive health if left untreated. [1-3]

The etiology of abnormal vaginal discharge is multifactorial, encompassing fungal, bacterial, and protozoal infections. *Candida albicans*, responsible for vulvovaginal candidiasis, is among the most common fungal pathogens, often causing thick, white, curd-like discharge accompanied by pruritus. Bacterial vaginosis, primarily associated with *Gardnerella vaginalis*

overgrowth, is marked by a thin, grayish discharge with a characteristic fishy odor, and may occur asymptomatically in some women. Trichomoniasis, caused by *Trichomonas vaginalis*, is a sexually transmitted protozoal infection that can produce frothy yellow-green discharge and has implications for fertility and pregnancy outcomes. [4-5] Other less frequent causes include sexually transmitted infections like *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, which may present with minimal or atypical symptoms, complicating timely diagnosis.

The clinical evaluation of abnormal vaginal discharge is essential for accurate diagnosis and appropriate management. Conventional approaches rely on history-taking, physical examination, and laboratory investigations including wet mount microscopy, Gram staining, Nugent scoring, and fungal culture. Physician-collected vaginal swabs are traditionally considered the gold standard, providing controlled sampling and reducing the risk of contamination. However, limitations such as patient discomfort, cultural barriers, privacy concerns, and access to healthcare facilities may hinder timely evaluation and reduce participation in screening programs, particularly in low-resource or rural settings.

Self-collected vaginal swabs have emerged as an alternative diagnostic approach, allowing women to collect specimens privately and at their convenience. Several studies have demonstrated that self-collected samples can provide comparable sensitivity and specificity to physician-collected swabs for common pathogens, potentially improving screening coverage and early detection of infections. [6] This approach is particularly valuable in community-based screening programs or telemedicine settings, where healthcare resources are limited or patient mobility is constrained.

Despite its advantages, concerns remain regarding the accuracy and reliability of self-collected swabs. Improper collection technique, insufficient sampling, or contamination can compromise pathogen detection, especially for organisms with low abundance, such as *Trichomonas vaginalis*. Consequently, comparative studies evaluating self-collected versus physician-collected swabs are essential to validate their diagnostic performance, assess concordance, and establish standardized protocols for clinical and public health practice. [7-8]

Understanding the clinical status of abnormal vaginal discharge and the effectiveness of different diagnostic approaches is crucial for improving reproductive health outcomes in women. Early identification and treatment of causative pathogens not only alleviates symptoms but also prevents complications such as pelvic inflammatory disease, infertility, preterm labor, and increased susceptibility to other sexually transmitted infections. Therefore, exploring reliable, accessible, and patient-friendly diagnostic strategies remains a key priority in gynecological care.

OBJECTIVE

To evaluate the clinical status of abnormal vaginal discharge in women.

METHODOLOGY

This cross-sectional descriptive observational study was conducted at the Department of Obstetrics and Gynaecology, Mymensingh Medical College Hospital, Bangladesh, over a period of one year and six months, from February 2020 to August 2021. The study included women of reproductive age (15–49 years) presenting with abnormal vaginal discharge in the outpatient department. After applying inclusion and exclusion criteria, a total of 222 participants were enrolled, with the sample size determined using an expected specificity of 95.8% for self-collected swabs in bacterial vaginosis, a 5% allowable error, and an estimated prevalence of bacterial vaginosis of 26.8%. Consecutive sampling was used to select participants who provided informed consent.

Exclusion criteria included pregnancy, postmenopausal status, menstruation, antimicrobial or antifungal therapy within the past 14 days, recent delivery or abortion within six weeks, and unwillingness to participate. Socio-demographic variables, including age, residence, education, occupation, and socio-economic status, were recorded. Laboratory variables included findings from wet mount preparation, Gram staining, and culture on Sabouraud's dextrose agar media. Abnormal vaginal discharge was defined as an increase in quantity or a change in consistency or odor compared to normal physiological discharge, with a focus on common causes such as bacterial vaginosis, vulvovaginal candidiasis, and trichomoniasis.

Each participant provided four vaginal swabs: two self-collected and two physician-collected. Participants were given verbal and pictorial instructions for self-collection, involving insertion of the swab 1–2 inches into the vagina, rotation for 360°, maintaining it for 20 seconds, and placement in a sterile tube. Subsequently, a trained physician collected swabs under aseptic conditions using a speculum. Swabs were labeled systematically, with one self-collected and one physician-collected swab used for wet mount and Gram staining, and the other pair for fungal culture on Sabouraud's dextrose agar media.

Wet mount preparations were examined under 40x and 100x magnification to identify *Trichomonas vaginalis* based on characteristic flagellated motility. Gram-stained smears were analyzed using the Nugent scoring system to detect bacterial vaginosis, considering

the relative proportions of *Lactobacillus*, *Gardnerella*, and *Mobiluncus* morphotypes. Fungal cultures were performed on Sabouraud's dextrose agar, prepared by dissolving dextrose, neopeptone, and agar, adjusting pH to 5.4, autoclaving, and incubating inoculated tubes for 24–72 hours to identify *Candida albicans*.

Data were collected using a pre-tested structured questionnaire by the principal investigator, with regular checks for consistency and completeness. Laboratory procedures were conducted in the hospital microbiology department following standardized protocols. Data were entered and analyzed using Microsoft Excel 2007 and SPSS version 26.0. Results were presented in tables and graphs, with statistical significance set at $p < 0.05$ and a 95% confidence interval. Expert supervision was provided by senior consultants and a biostatistician to ensure the validity, reliability, and accuracy of the collected data.

RESULTS

Among the 222 women included in the study, Candida albicans was the most frequently detected organism, identified in 43.2% of participants by culture on Sabouraud's dextrose agar. Gardnerella vaginalis was the second most common pathogen, found in 28.4% of women using Nugent scoring of Gram-stained smears, while Trichomonas vaginalis was the least prevalent, detected in 3.6% of cases through wet mount examination. No pathogenic organism was identified in 24.8% of participants, indicating that nearly one-fourth of women with abnormal vaginal discharge had either non-infectious causes or undetected pathogens. Overall, fungal infections, particularly candidiasis, were the leading cause of abnormal vaginal discharge in this population, followed by bacterial vaginosis and trichomoniasis.

Table-1: Distribution of organisms causing abnormal vaginal discharge among the participants (n=222)

Vaginal sample	Percentage
Candida albicans detected by culture in Sabouraud's dextrose agar media	43.24
Gardnerella vaginalis detected by Nugent score	28.38
Trichomonas vaginalis detected by wet mount preparation	3.61
Organism not found	24.77
Total	100.00

The distribution of Candida albicans infection across socio-demographic variables showed that prevalence increased slightly with age, with 32.5% of women aged 15–25 years, 43.3% of those 26–35 years, and 47.0% of women 36–45 years testing positive, although this difference was not statistically significant ($p = 0.283$). Urban residents had a marginally higher positivity rate (45.1%) compared to rural residents (41.3%), but the association with residence was also not significant ($p = 0.563$). Regarding education, positivity rates varied from 23.5% among women with higher secondary education to 56.3% in graduates and above, without significant correlation ($p = 0.352$). Housewives and service holders had similar rates of infection (42.6% vs. 45.3%; $p = 0.711$), and socio-economic status did not show a significant impact, with 42.9% of low-income and 44.2% of middle-income women testing positive ($p = 0.876$). Overall, Candida albicans infection appeared evenly distributed across socio-demographic groups, with no statistically significant associations identified.

Table 2: Distribution of both positive and negative cases of *Candida albicans* according to socio-demographic variables (n=222)

Variable	Category	*Candida albicans*		Total n (%)	P value*
		Positive n (%)	Negative n (%)		
Age group of the patients (In years)	15-25	13(32.50)	27(67.50)	40 (18.02)	0.283
	26-35	29 (43.28)	38(56.72)	67 (30.18)	
	36-45	54 (46.96)	61(53.04)	115 (51.80)	
Residence	Urban	51(45.13)	62(54.86)	113 (50.90)	0.563
	Rural	45 (41.28)	64(58.72)	109 (49.10)	
Education	No formal education	29 (42.03)	40(57.97)	69 (31.08)	0.352
	Primary	39 (46.98)	44(53.01)	83(37.39)	
	Secondary	15 (40.54)	22(59.46)	37 (16.67)	
	Higher secondary	4 (23.53)	13(76.47)	17 (7.66)	
	Graduate & above	9 (56.25)	7 (43.75)	16 (7.21)	
Occupation	Housewife	75 (42.61)	101(57.39)	176 (79.27)	0.711
	Service holder	21 (45.35)	25(54.27)	46 (20.72)	
Socio- economic condition	Low	73 (42.94)	97 (57.06)	170 (76.58)	0.876
	Middle	23 (44.23)	29 (55.77)	52 (23.42)	

Statistical test: Chi square test (*p value considered significant when <0.05)

The distribution of Gardnerella vaginalis infection across socio-demographic variables revealed that prevalence was slightly higher among women aged 26–35 years (34.3%) compared to 36–45 years (26.1%)

and 15–25 years (25.0%), although the differences were not statistically significant (p = 0.430). Positivity rates were similar in urban (27.4%) and rural (29.4%) residents, showing no significant association with place of residence (p = 0.751). When considering education, the prevalence ranged from 25.0% in graduates and above to 35.1% in women with secondary education, with no significant correlation (p = 0.890). Housewives had a higher positivity rate (31.3%) compared to service holders (17.4%), which approached but did not reach statistical significance (p = 0.063). Socio-economic status had minimal impact, with 28.8% of low-income and 26.9% of middle-income women testing positive (p = 0.790). Overall, Gardnerella vaginalis infection appeared evenly distributed across socio-demographic groups, with no statistically significant associations observed.

Table 3: Distribution of both positive and negative cases of *Gardnerella vaginalis* according to socio-demographic variables (n=222)

Variable	Category	*Gardnerella vaginalis*		Total n (%)	P value*
		Positive n (%)	Negative n (%)		
Age group of the patients (In years)	15-25	10 (25.00)	30 (75.00)	40 (18.02)	0.430
	26-35	23 (34.33)	44 (65.67)	67 (30.18)	
	36-45	30 (26.09)	85 (73.91)	115 (51.80)	
Residence	Urban	31 (27.43)	82 (72.57)	113 (50.90)	0.751
	Rural	32 (29.36)	77 (70.64)	109 (49.10)	
Education	No formal education	18 (26.09)	51 (73.91)	69 (31.08)	0.890
	Primary	23 (27.71)	60 (72.29)	83 (37.39)	
	Secondary	13 (35.14)	24 (64.86)	37 (16.67)	
	Higher secondary	5 (29.41)	12 (70.59)	17 (7.66)	
	Graduate & above	4 (25.00)	12 (75.00)	16 (7.21)	
Occupation	Housewife	55 (31.25)	121 (68.75)	176 (79.28)	0.063
	Service holder	8 (17.39)	38 (82.61)	46 (20.72)	
Socio- economic condition	Low	49 (28.82)	121 (71.18)	170 (76.58)	0.790
	Middle	14 (26.92)	38 (73.08)	52 (23.42)	

Statistical test: Chi square test (*p value considered significant when <0.05)

The distribution of Trichomonas vaginalis infection according to socio-demographic variables showed a significant association with age (p = 0.025), with the highest prevalence observed in women aged 15–25 years (10.0%), followed by 26–35 years (4.5%) and 36–45 years (0.9%). No significant differences were observed based on residence, with urban women showing a prevalence of 2.7% and rural women 4.6% (p = 0.440). Education level did not significantly influence infection rates, ranging from 2.9% among women with no formal education to 6.3% in graduates and above (p = 0.943). Similarly, occupation and socio-economic status were not significantly associated with Trichomonas infection, with housewives slightly higher (4.0%) than service holders (2.2%) and low-income women (4.1%) slightly higher than middle-income women (1.9%). Overall, Trichomonas vaginalis infection was relatively uncommon in this study population and primarily concentrated in younger women, while other socio-demographic factors showed no significant correlation.

Table 4: Distribution of both positive and negative cases of *Trichomonas vaginalis* according to socio-demographic variables (n=222)

Variable	Category	*Trichomonas vaginalis*		Total n (%)	P value*
		Positive n (%)	Negative n (%)		
Age group of the patients (In years)	15-25	4 (10.00)	36 (90.00)	40 (18.02)	0.025
	26-35	3 (4.48)	64 (95.52)	67 (30.18)	
	36-45	1 (0.87)	114(99.13)	115 (51.80)	
Residence	Urban	3 (2.65)	110 (97.35)	113 (50.90)	0.440
	Rural	5 (4.59)	104 (95.41)	109 (49.10)	
Education	No formal education	2 (2.90)	67 (97.10)	69 (31.08)	0.943
	Primary	3 (3.61)	80 (96.39)	83 (37.39)	
	Secondary	1 (2.70)	36 (97.30)	37 (16.67)	
	Higher secondary	1 (5.88)	16 (94.12)	17 (7.66)	
	Graduate & above	1 (6.25)	15 (93.75)	16(7.21)	
Occupation	Housewife	7 (3.98)	169 (96.02)	176 (79.28)	0.559
	Service holder	1 (2.17)	45 (97.83)	46(20.72)	
Socio-economic condition	Low	7 (4.12)	163 (95.88)	170 (76.58)	0.457

Statistical test: Chi square test (*p value considered significant when <0.05)

The detection of **Candida albicans** using self-collected and physician-collected vaginal swabs demonstrated a high level of concordance. Out of 96 positive cases identified by physician-collected swabs, 92 (95.8%) were correctly detected by self-collected swabs, while 4 cases (4.2%) were missed. Only 2 samples (1.6%) were false positives with self-collected swabs. Overall, 94 participants (42.3%) tested positive and 128 (57.7%) tested negative using self-collected swabs. The association between the two methods was statistically significant ($p < 0.001$), indicating that self-collected swabs are highly reliable for detecting **Candida albicans** in women with abnormal vaginal discharge.

Table 5: Detection of *Candida albicans* by self-collected and physician- collected vaginal swabs (n =222)

Self-collected vaginal swabs	Physician-collected vaginal swabs		Total n (%)	P value*
	Positive n (%)	Negative n (%)		
Positive	92 (95.83)	2 (1.59)	94 (42.34)	<0.001
Negative	4 (4.17)	124 (98.41)	128 (57.66)	
Total	96 (43.24)	126 (56.75)	222 (100)	

Statistical test: Chi square test (*p value considered significant when <0.05)

DISCUSSION

The present study demonstrates that Candida albicans was the most commonly detected organism among women with abnormal vaginal discharge, identified in 43.2% of participants. This finding aligns with several previous studies that have reported candidiasis as the leading cause of abnormal vaginal discharge. For example, one study found a prevalence of 41–45% for Candida infections among women of reproductive age, while other study reported a similar rate of 42%. Our results reinforce the global observation that fungal infections are a primary contributor to vaginal complaints, particularly in low- and middle-income populations, where socio-economic and educational factors may limit timely healthcare access. [8-9]

Gardnerella vaginalis, indicative of bacterial vaginosis, was detected in 28.4% of participants in this study. This prevalence is comparable to studies who reported rates ranging from 25–30% in similar outpatient populations. Unlike Candida albicans, Gardnerella infection did not show a clear trend across age groups or socio-economic status, suggesting a relatively uniform distribution among women regardless of demographic factors. [10] The near-equal prevalence in urban (27.4%) and rural (29.4%) residents indicates that bacterial vaginosis affects women broadly and is not strongly influenced by geographical or socio-economic differences, a pattern also observed in studies from South Asia.

In contrast, Trichomonas vaginalis was comparatively rare, identified in only 3.6% of participants. This is consistent with prior regional studies reporting Trichomonas prevalence between 2–5%. [11] Notably, our study found a significant association between age and Trichomonas infection, with younger women (15–25 years) showing the highest prevalence (10%). This pattern mirrors findings highlighting that sexually transmitted pathogens like Trichomonas are more common in younger, sexually active populations, while older women show lower infection rates. [12] Other socio-demographic variables such as residence, education, occupation, and socio-economic status were not significantly associated with Trichomonas infection in our cohort.

The socio-demographic analysis for Candida and Gardnerella showed no significant differences across age, residence, education, occupation, or income, suggesting that these infections are broadly distributed among reproductive-aged women. This finding is in line with other studies, who observed that bacterial vaginosis and candidiasis are prevalent across diverse socio-economic and educational backgrounds. [13] The uniform distribution underscores the importance of universal screening approaches rather than targeting only high-risk groups, particularly in community and outpatient settings.

A key component of our study was the comparison of self-collected versus physician-collected vaginal swabs for Candida detection. The results demonstrated excellent concordance, with 95.8% sensitivity and 98.4% specificity for self-collected swabs, closely mirroring physician-collected samples. These findings are consistent with prior studies, [14] which highlighted the reliability of self-collection methods for both Candida and Gardnerella detection. Our results support self-collection as a feasible, patient-friendly alternative, particularly beneficial for expanding diagnostic access in resource-limited settings and improving participation in routine screening programs.

Overall, our study confirms the global trends of vaginal infections, emphasizing Candida albicans as the primary pathogen, followed by Gardnerella vaginalis and Trichomonas vaginalis. The strong agreement between self- and physician-collected swabs underscores the practical utility of self-sampling in clinical practice. While Trichomonas remains relatively uncommon, it predominantly affects younger women, indicating the need for targeted education and preventive measures in this group. These findings highlight the importance of both clinical and community-level strategies for the

diagnosis, management, and prevention of abnormal vaginal discharge in women of reproductive age.

CONCLUSION

In conclusion, this study demonstrates that Candida albicans is the most prevalent cause of abnormal vaginal discharge among women of reproductive age, followed by Gardnerella vaginalis, while Trichomonas vaginalis remains comparatively rare. The distribution of infections was largely independent of socio-demographic factors such as residence, education, occupation, and socio-economic status, although younger women were more affected by Trichomonas infection. Importantly, self-collected vaginal swabs showed excellent concordance with physician-collected swabs for the detection of Candida and Gardnerella, with high sensitivity, specificity, and predictive values, supporting the reliability and feasibility of self-sampling as a patient-friendly diagnostic alternative. These findings highlight that self-collection can enhance early detection, improve accessibility to screening, and facilitate effective management of vaginal infections, particularly in community and resource-limited settings.

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