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High Prevalence of Vaginal Candidiasis and Absence of *Trichomonas vaginalis* Among Female Patients in Da Nang, Vietnam

Vinh Xuan Le [1], Kieu Thi Nguyen [1], Minh Van Nguyen [1], Tram ThiHoang Ho [1], Tuyen ThiThanh Tran [2], Cong Phi Dang [3], Van Cao [3] and Thuy Thi Le [3,*]

[1] Da Nang Dermato-Venereology Hospital, Da Nang 50300, Vietnam
[2] Da Nang Hospital, Da Nang 50207, Vietnam
[3] Faculty of Medical Laboratory Science, Da Nang University of Medical Technology and Pharmacy, Da Nang 50200, Vietnam
* Correspondence: lethithuy@dhktyduocdn.edu.vn

Abstract

Vaginitis is a major health concern among women, with inadequate treatment potentially leading to reproductive complications. This study aimed to assess vaginitis prevalence, identify predominant pathogens, and evaluate associated risk factors among female patients at Da Nang Dermato-Venereology Hospital. A prospective study of 796 female patients undergoing physical examinations was conducted, with demographic, clinical, and microbiological data collected. Vaginitis was diagnosed in 180 (22.6%) of 796 female patients, predominantly caused by *Candida* spp. (66.1%) and bacterial pathogens (31.7%), with no *Trichomonas vaginalis* detected, and was most prevalent in women aged 20–30 years. Poor hygiene practices, including infrequent sanitary pad changes (OR = 5.01, $p < 0.001$) and routine vaginal douching (OR = 6.77, $p < 0.001$), were significantly associated with vaginitis. The Amsel criteria showed high specificity (99.1%) for bacterial vaginosis diagnosis. The absence of *T. vaginalis* suggests a potential shift in the epidemiology of vaginal infections. The Amsel criteria are a practical diagnostic tool in resource-limited settings. Our findings highlight the need for targeted hygiene education to reduce vaginitis prevalence in Vietnam.

Keywords: vaginitis; candidiasis; *T. vaginalis*; hygiene practice

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1. Introduction

Vaginitis is a common gynecological condition in women of reproductive age. Vaginitis represents the most prevalent gynecological issue encountered in clinical practice, making it essential for healthcare providers to accurately diagnose and effectively manage this condition in both nonpregnant and pregnant patients to prevent avoidable complications [1]. Defined as the inflammation of the vagina, vaginitis can arise from both infectious and noninfectious origins [2]. Common infectious conditions include bacterial vaginosis (BV), vulvovaginal candidiasis (VVC), and trichomoniasis vaginitis (TV), while frequent noninfectious triggers observed in clinical environments encompass allergic reactions, irritations, and atrophic vaginitis resulting from estrogen deficiency [3]. The clinical manifestations of vaginitis may vary according to its etiology, necessitating that clinicians evaluate a wide range of vaginal symptoms, such as abnormal discharge, vulvovaginal discomfort, unpleasant vaginal odor, itching in the vaginal and vulvar areas, dyspareunia, and dysuria [4].

The prevalence of BV in the general population is notably high worldwide, with estimates ranging from 23% to 29% across various regions: 23% in Europe and Central

Asia, 24% in East Asia and the Pacific, 24% in Latin America and the Caribbean, 25% in the Middle East and North Africa, 25% in sub-Saharan Africa, 27% in North America, and 29% in South Asia [5]. In addition, recurrent VVC impacts approximately 138 million women each year (with estimates ranging from 103 to 172 million), resulting in a worldwide annual prevalence of 3871 cases per 100,000 women; over a lifetime, 372 million women are projected to experience recurrent vulvovaginal candidiasis [6]. In Southeast Asia, the prevalence of BV is as high as 30% among women in the general population and reaches 50–60% in women with high-risk sexual behavior [7]. The occurrence of VVC in Southeast Asian nations is reported to be 23.0%, with discrepancies attributed to various factors, including host-specific and geographical variations, which contribute to inconsistencies in healthcare quality [8]. Enhanced monitoring and stricter regulations regarding antifungal usage are crucial to address the potential threat posed by the rise of multi-drug-resistant *Candida* species, such as *Candida auris* [9,10].

In recent years, economic growth and increased public health awareness in Vietnam and ASEAN have contributed to changes in societal and disease patterns [11]. These demographic changes, coupled with the adoption of unhealthy lifestyle behaviors, may elevate the risk of vaginitis [12]. Despite advancements in healthcare infrastructure, disparities in access persist, and community-based reproductive health initiatives continue to face significant challenges, particularly in addressing evolving disease patterns. Moreover, epidemiological research on reproductive tract infections remains limited within this change of the context. In Vietnam, data on *Trichomonas vaginalis* prevalence are scarce, limiting the understanding of its epidemiological trends. Da Nang, a rapidly urbanizing coastal city and major tourist hub in Vietnam, experiences unique demographic and lifestyle shifts that may influence reproductive health outcomes; however, epidemiological data on vaginitis remain limited.

This study aims to assess the prevalence of vaginitis and identify the predominant causative pathogens among female patients at Da Nang Dermato-Venereology Hospital in Central Vietnam. Additionally, the study evaluates associated risk factors to support future prevention strategies targeting these common infectious conditions. By providing updated data from Vietnam, this research contributes to the regional understanding of vaginal infection patterns in Southeast Asia, particularly within the ASEAN region, which is currently experiencing rapid socioeconomic and public health transitions.

2. Materials and Methods

2.1. Research Ethics Issues and Sample Population

This study was designed following the ethical guidelines outlined in the Declaration of Helsinki. Our research protocol was approved by Institutional Review Board of Da Nang University of Medical Technology and Pharmacy, with reference number 81/PCT-HDDD, dated 16 December 2022. Informed consent was obtained from patients and/or their legal representatives before participating in the study. Patients admitted between January 2023 and August 2023 were recruited, with a unique identifier assigned for each patient. All data collected from the research questionnaires were subjected to encryption for confidentiality, and only the research leader had access to the patient data.

2.2. Participant Recruitment

Our study recruited 796 female participants visiting the Gynecology Department of Da Nang Dermato-Venereology Hospital for physical examination. Our consultancy was provided to participants to verify any potential confounding factors that could affect diagnostic accuracy. Patients were excluded from the study if they met any of the following criteria: patients who did not provide consent to participate in the study; pregnant

women; women under 18 years old who have not had sexual intercourse; those who were menstruating or experiencing vaginal bleeding; patients with genital tract malignancies (cervical and endometrial carcinomas, and upper genital part damage); those who had performed either douching or used vaginal medication within 48 h before the examination; those who had taken systemic antibiotics within 3 days before the examination; those who had taken systemic antifungal drugs or unidentified medications within 1 week before the examination; those with a positive rapid Chlamydia test result.

2.3. Microbiology Laboratory Assessment and Data Collection

The gynecologist collected a range of clinical information, which included physical symptoms such as unusual sensations (notably itching; irritation described as stinging or burning; and other discomforts like dyspareunia, lower abdominal pain, and painful urination), along with vulvovaginal erythema, edema, and/or fissures. The gynecologist then performed a pelvic examination using a speculum and collected vaginal discharge samples with a sterile cotton swab in accordance with standard procedures. Furthermore, alterations in vaginal discharge were observed, emphasizing characteristics such as odor, color, viscosity, and volume (categorized as average, high volume spontaneous discharge from the vagina, or low volume, where a single cotton swab suffices to absorb all vaginal discharge) [13–16].

Traditional laboratory evaluations—including vaginal pH measurement, the Whiff test, wet mount microscopy, Gram staining, Trichomonas vaginalis culture, and the identification of clue cells—were performed by a clinical physician within one hour of sample collection to assess the presence of vaginitis, particularly bacterial vaginosis (BV), vulvovaginal candidiasis (VVC), and trichomonas vaginitis (TV) [13–16]. The Whiff test was conducted by adding a few drops of 10% potassium hydroxide (KOH) solution to a vaginal discharge sample placed on a clean glass slide; a strong fishy odor indicated a positive result [16]. The vaginal sample's pH was assessed by using a *CiTEST* Vaginal pH Rapid Test (CiTEST Diagnostics Inc., Vancouver, BC, Canada). *Trichomonas vaginalis* was detected using wet mount microscopy and confirmed by the culture on Modified Diamond's Medium (Hardy Diagnostics, Santa Maria, CA, USA). The evaluation of pathogenic *Candida* species was performed through wet mount microscopy, which revealed the presence of pseudohyphae, a significant rise in the quantity of budding yeast, and/or blastospores. Light microscopy of Gram-stained smears was the primary method used to diagnose bacterial infections [13–16].

For diagnosing BV, Amsel's criteria were utilized [17]. According to these criteria, a diagnosis of BV is made if at least three of the following four conditions are met:

- A grayish-white, thin, and homogeneous vaginal discharge;
- A vaginal pH exceeding 4.5;
- A fishy or amine odor following the addition of 10% KOH;
- The presence of clue cells (greater than 20%) observed under microscopic examination.

Gram staining was performed to calculate the Nugent score by a clinical microbiologist. The Nugent scoring system is based on the relative abundance of various bacterial morphotypes, including *Lactobacillus*-like (large uniform Gram-positive bacilli), *Gardnerella vaginalis*-like (small pleomorphic Gram-variable bacilli), *Prevotella/Bacteroides*-like (small Gram-negative bacilli), and *Mobiluncus*-like (curved Gram-variable bacilli). A Nugent score ranging from 7 to 10 is interpreted as indicative of BV, a score of 4 to 6 is considered intermediate, while a score of 0 to 3 is interpreted as a negative result for BV [18]. All microbiological assessments were conducted by trained clinical microbiologists, with all the samples analyzed in duplicate to ensure reproducibility.

Personal data were obtained through questionnaires that inquired about participants' age, residential location, occupation, educational background, and healthcare behavior

such as age at first sexual intercourse, practices related to vaginal douching, and menstrual hygiene. Hygiene practices were assessed via a standardized questionnaire, including the frequency of sanitary pad changes during menstruation (categorized as once, twice, and three or more times each day) and the vaginal douching practice (yes/no).

2.4. Statistics Analysis

Statistical calculations and figures' generation were performed using IBM SPSS Statistics version 20 (IBM, Armonk, NY, USA), Excel 2010 (Microsoft, Redmond, WA, USA), and R/R studio (version 4.3.0, open-source program). The Chi-square test (χ^2) and Fisher's exact test were employed to evaluate the association of ordinal variables. The Chi-square test was used to compare the proportions of bacterial vaginosis diagnosed by the Amsel criteria and the Nugent scoring system. A statistical significance was considered when p-value < 0.05. The correlation of risk factors was calculated using odds ratios with 95% confidence intervals (CIs).

3. Results

3.1. Demographic Data

A total of 796 participants were enrolled in the study (Table 1). The majority were aged 18–30 years, accounting for 574 individuals (72.1%). Baseline characteristics included educational level, occupation, residential area, and marital status. Most participants had attained a university or college education (n = 629, 79%). Occupations varied across the cohort. The majority resided in urban areas (n = 584, 73.4%). Marital status was categorized as married (59.9%) or single/divorced (40.1%).

Table 1. Demographic data of the population.

Categories	Group	No (%)
Age groups	18–30	574 (72.1%)
	31–50	205 (25.8%)
	>50	17 (2.1%)
Education	High school and lower	83 (10.4%)
	University, college	629 (79.0%)
	Post-graduate	84 (10.6%)
Occupation	Officer	9 (1.1%)
	Industrial worker	36 (4.5%)
	Businessman, housework	101 (12.7%)
	Others	650 (81.7%)
Residence	Urban	584 (73.4%)
	Rural	192 (24.1%)
	Others	20 (2.5%)
Marriage	Married	477 (59.9%)
	Single/Divorced	319 (41.1%)

3.2. Prevalence of Vaginitis and Risk Factors' Analysis

Of the 796 participants, 180 were diagnosed with vaginitis (Table 2). *Candida* spp. was the predominant pathogen, detected in 119 cases (66.1%), followed by bacterial infections in 57 cases (31.7%); no Trichomonas vaginalis infections were identified. Clinical manifestations varied, with pruritus reported most frequently (n = 82, 45.6%), followed by irritation (n = 62, 34.4%). Benign vulvar lesions were present in 101 patients (56.1%). Vaginal discharge characteristics—volume, odor, color, and viscosity—were documented and are detailed in Table 3.

Table 2. Proportion of vaginitis categories.

Group	Number	Percentage (%) [95%CI]
Nonvaginitis	616	77.4 [74.5; 80.3]
Vaginitis	180	22.6 [19.7; 25.5]
BV	*57*	*31.67 [24.8; 38.5]*
VVC	*119*	*66.11 [59.1; 73.1]*
TV	*0*	*0.0 [0; 1.67]*
Concurrent (BV and CV)	*4*	*2.22 [0.1; 4.4]*

Percentages for BV, VVC, TV, concurrent (BV and CV) are relative to total vaginitis cases (n = 180). We propose keep the italics words in the table for the idea of sub-categories of Vaginitis.

Table 3. Physical abnormalities from the examination of vaginitis patients.

Physical Issues			Vaginitis Patients	Percent (%)
Physical symptoms		No symptom	20	11.1
		Itchy	82	45.6
		Irritant (stinging, burning sensation)	62	34.4
		Others (dyspareunia, lower abdominal pain, and painful urination)	16	8.9
Vulvovaginal abnormalities (erythema, edema, and/or fissures)		Yes	101	56.1
		No	79	43.9
Vaginal discharge	Volume	High volume	60	33.3
		Average volume	76	42.2
		Low volume	44	24.4
	Fishy odor	Yes	50	27.8
		No	130	72.2
	Color	Yellow	56	31.1
		Green	60	33.3
		White (normal)	64	35.6
	Viscosity	Normal	1	0.6
		Dilute	104	57.8
		Thick	75	41.7
	pH	≥4.5	60	33.3
		<4.5	120	66.7

The analysis showed that vaginitis predominantly affected women aged 19–47, with *Candida* spp. and bacterial pathogens identified as the primary etiological agents (Figure 1). The mean age of patients with BV was 25.25 years, compared to 28.03 years for those with candidal vaginitis. *Candida* infections were the most common across all age groups. While age at first sexual intercourse was not significantly associated with vaginitis, hygiene-related behaviors showed strong associations. Infrequent changing of sanitary pads was linked to a higher risk (OR = 5.01, 95% CI: 2.51–10.00, $p < 0.001$), as was routine vaginal douching (OR = 6.77, 95% CI: 4.21–10.87, $p < 0.001$) (Figure 2).

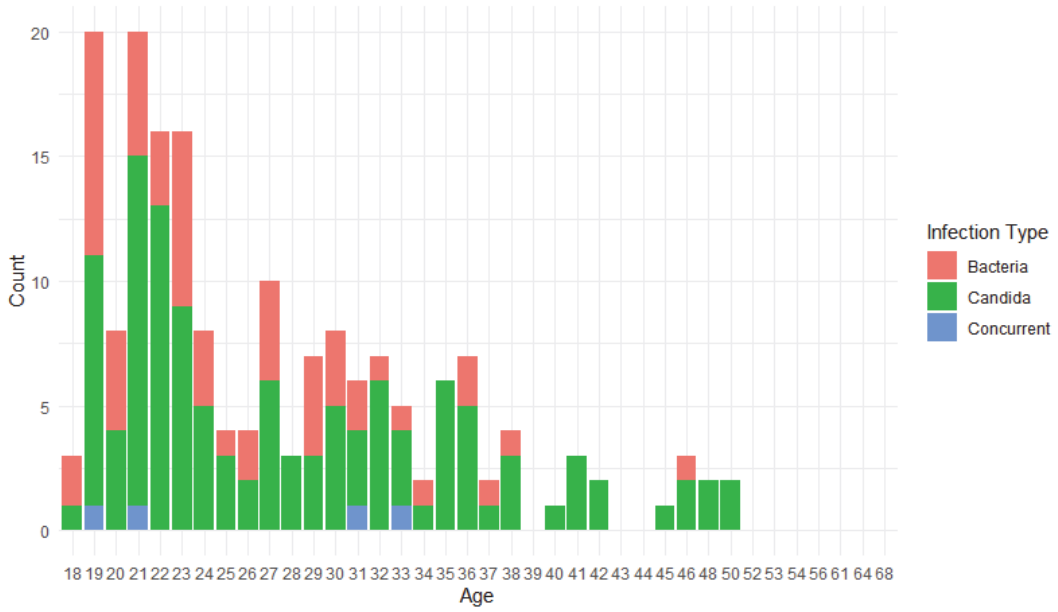

Figure 1. Bar chart illustrating the number of vaginitis cases caused by *Candida* spp., bacterial pathogens, and concurrent infections (*Candida* yeast and bacteria) across the ages. The y-axis represents the number of cases, and the x-axis indicates the age.

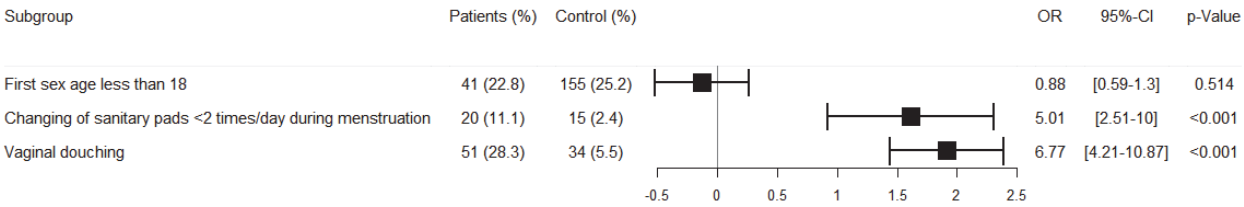

Figure 2. Correlation of general factors with the microorganism-invaded condition in the cohort as demonstrated by odds ratio with a 95% confidence interval. Log odds ratio >0 indicates an increased risk of invasion, while log OR < 0 indicates a decreased risk.

3.3. Comparison of the Amsel and Nugent Score for Vaginitis Diagnosis

BV was diagnosed in this study using two well-established diagnostic approaches: Amsel's clinical criteria and the Nugent scoring system. In our data, the number of positive cases with Amsel's criteria accounted for 7.7%, while cases diagnosed by the Nugent score were at 6.9% amongst the cohort of 796 participants (Table 4).

Table 4. Comparison of Amsel diagnosis with Nugent score as gold standard of BV diagnosis (abbreviations: PPV: positive predictive value; NPV: negative predictive value).

Method of Diagnosis		Nugent's Criteria			Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
		Positive	Negative	Total				
Amsel's criteria	Positive	54	7	61 (7.7%)	98.2	99.1	88.5	99.9
	Negative	1	734	735 (92.3%)				
	Total	55 (6.9%)	741 (93.1%)					

Compared to Nugent as the gold standard for BV diagnosis, the Amsel score in our cohort indicated high sensitivity and specificity with 98.2 and 99.1%, suggesting the Amsel score is notably reliable in BV diagnosis.

4. Discussion

4.1. Prevalence of Vaginitis and Its Causal Pathogen in the Cohort

In our study, of the 796 female patients attending clinical examinations in Da Nang City of Vietnam, 180 (22.6%) were diagnosed with vaginitis. Notably, no instances of *Trichomonas vaginalis* infection were detected. Of these cases, vulvovaginal candidiasis (VVC) was the predominant cause, accounting for 66.11% (119 cases), while BV constituted 31.67% (57 cases).

The prevalence of BV in our cohort (7.16% of the total population) is lower than that reported in other Vietnamese regions. For instance, a study in Hue City found an 11.1% prevalence among pregnant women [19], and research in Ho Chi Minh City reported a 30.57% prevalence among women presenting with abnormal vaginal discharge [20]. Regarding VVC, our observed rate (14.94% of the total population) aligns with the lower spectrum of prevalence reported in Southeast Asia. A systematic review indicated a pooled VVC prevalence of 23.0% across the region, with Vietnam-specific estimates around 29% [8]. Co-infections of BV and VVC were relatively uncommon in our study, affecting approximately 5% of clinic visitors. This is significantly lower than the 72.4% co-infection rate reported among pregnant women with BV in Hue City [19]. However, our study might have a limitation, as the data were recorded from patients served by a single hospital, which might not fully represent the characteristics of the population.

Notably, no *Trichomonas vaginalis* infections were detected in our cohort. This contrasts with studies reporting a 1.7% prevalence in the Mekong Delta region of Vietnam [21]; furthermore, another study in northern Taiwan indicated a 2.1% prevalence among women suffering from vaginitis [22]. Additional studies from China [23], Nigeria [24], and Yemen [25] have also reported similar findings of trichomonads' appearances. The absence of *T. vaginalis* in our cohort may reflect changes in sexual behavior in Da Nang, consistent with prior local studies which focused on patients seeking a clinical diagnosis for sexually transmitted infections (STIs) [26]. The absence of *T. vaginalis* may suggest variations in demographic factors and lifestyle practices, potentially indicating a shift in the disease model within this area that needs deeper research to explore the exact explanation.

These findings underscore the predominance of candidal and bacterial pathogens in vaginitis cases within our study population and highlight regional variations in pathogen prevalence. Public health interventions should focus on community-based education to promote optimal menstrual hygiene, potentially through school programs targeting young women.

4.2. Risk Factors of Vaginitis in the Cohort

Although vaginitis was found in every age from youngsters to the elderly, the age between 20 and 30 revealed the highest incidence of vaginitis, with candidiasis and bacterial vaginosis. Interestingly, candidiasis was responsible for a greater number of vaginitis cases. There are reasons causing VVC during this reproductive period, including pregnancy, antibiotic usage, sexual infection, or other disease like diabetes [4]. Any factor leading to the disorder of the vaginal environment and reduction of commensal flora will pave the way for opportunistic fungal development. As such, in our analysis of risk factors of vaginitis, we found that the infrequent changing of sanitary pads was significantly associated with a higher risk of vaginitis (OR = 5.01, CI 95% 2.51–10, $p < 0.001$). In contrast, those with a frequent habit of vaginal douching leading to alteration of vaginal pH

and commensal flora were also at high risk of vaginitis (OR = 6.77, CI 95% 4.21–10.87, $p < 0.001$). Therefore, it is critical for women to be trained on how to protect their reproductive healthcare, particularly among young women of reproductive age.

4.3. Comparison of Nugent and Amsel's Methods in Vaginitis Diagnosis

A BV diagnosis commonly employs two established methods: the Nugent scoring system and the Amsel criteria. The Nugent method, considered the gold standard, utilizes Gram-stained vaginal smears to assess the presence of specific bacterial morphotypes, offering high sensitivity and reproducibility. Conversely, Amsel's criteria rely on clinical evaluation, including homogeneous vaginal discharge, elevated vaginal pH (>4.5), a positive "Whiff" test, and the presence of clue cells on microscopy [27]. However, other studies currently show that both Nugent and Amsel's methods are comparable for BV diagnosis in their region [15,28]. In our study, Amsel's criteria demonstrated a sensitivity of 98.2%, specificity of 99.1%, positive predictive value (PPV) of 88.5%, and negative predictive value (NPV) of 99.9% when compared to the Nugent scoring system. These findings suggest that, within our cohort, Amsel's criteria effectively identified BV cases, potentially due to the symptomatic nature of the participants. Comparative studies have reported varying sensitivities and specificities for Amsel's criteria. For instance, a study in Nepal reported a sensitivity of 50% and specificity of 98.2%, while research in Ethiopia found a sensitivity of 85.7% and specificity of 98%. These discrepancies may stem from differences in study populations, symptom presentation, and clinician expertise [29,30].

Notably, individual components of Amsel's criteria vary in diagnostic performance. The presence of clue cells consistently shows high specificity, reaching 100% in some studies. However, the overall sensitivity of Amsel's criteria can be limited, particularly in asymptomatic individuals, underscoring the importance of comprehensive diagnostic approaches [29]. In resource-limited settings, where laboratory facilities may be scarce, Amsel's criteria offer a practical alternative for BV diagnosis. Nevertheless, when feasible, the Nugent scoring system remains the preferred method due to its higher sensitivity and objectivity. Clinicians should consider the strengths and limitations of each method, tailoring their diagnostic approach to the clinical context and available resources [29]. In our study, the Amsel method showed great sensitivity of over 90%, indicating accuracy in diagnosis for the patients in the region. Another concern in most patients seeking clinical exams in our cohort was that they suffered from particular symptoms, which led to a higher sensitivity of the Amsel score in our data.

5. Conclusions

This study revealed a high prevalence of vulvovaginal candidiasis (22.6%) among female patients, particularly among those aged 20–30 years, with no cases of *Trichomonas vaginalis* infection detected. Our findings indicated that poor menstrual hygiene and vaginal douching habits disrupting vaginal flora were significant risk factors. Amsel's criteria proved reliable for BV diagnosis, making it a practical tool in resource-limited settings. Public health campaigns should target female adolescents through school-based education to promote proper menstrual hygiene to reduce vaginitis prevalence in Vietnam.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The original contributions presented in this study are included in the article and no supplementary material in this manuscript. Further inquiries can be directed to the corresponding author.

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Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

ASEAN	The Association of Southeast Asian Nations
BV	Bacterial vaginosis
CI	Confidence interval
CV	Candidal vaginitis
NPV	Negative predictive value
OR	Odds ratio
PPV	Positive predictive value
STIs	Sexually transmitted infections
VVC	Vulvovaginal candidiasis
TV	Trichomoniasis vaginitis

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