

Prevalence and Associated Factors of Candida Vaginitis among Women Attending A Regional Hospital in Dak Lak, Vietnam: A Mixed-Methods Study

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Abstract: **Background:** Vulvovaginal candidiasis (VVC) is a common gynecological infection with substantial effects on women's physical and psychosocial well-being. Despite regional variations in its prevalence and determinants across Vietnam, no mixed-methods investigation has been conducted in the Central Highlands. This study aimed to determine the prevalence and associated factors of VVC and to explore women's perceptions and lived experiences. **Methods:** A mixed-methods cross-sectional study was conducted among 304 women. Quantitative data were collected using structured interviews and laboratory diagnosis through wet-mount microscopy. VVC was diagnosed when at least two of three characteristic symptoms were present together with a positive vaginal wet mount for *Candida* species. Qualitative data were obtained through semi-structured interviews with 32 participants. Statistical analyses were performed using STATA 17, estimating prevalence ratios (RR) and 95% confidence intervals (CI) with Poisson regression and robust variance. **Results:** The prevalence of *Candida* spp. on vaginal wet mount was 32.24%, while clinically diagnosed VVC accounted for 22.37% (68/304). Two factors were independently associated with infection: having two or fewer childbirths (PR = 2.04; 95% CI: 1.02–4.06; p = 0.043) and drying underwear in shaded areas (PR = 0.52; 95% CI: 0.27–0.99; p = 0.048). Qualitative findings revealed three main themes - "Recurrent Cycle," "Invisible Burden," and "Passive Cognition" - reflecting recurrent infection, psychosocial strain, and reactive awareness. **Conclusions:** VVC is a prevalent, recurrent condition among women in Vietnam's Central Highlands. Integrated findings emphasize the need for proactive education, behavioral counseling, and holistic management within reproductive health care.

Keywords: *Candida* vaginitis; Prevalence; Associated factors; Mixed-methods; Women's health; Central Highlands; Vietnam.

INTRODUCTION

Vulvovaginal candidiasis (VVC) is among the most prevalent vaginal infections affecting women of reproductive age, with up to 75% experiencing at least one episode and approximately 5–8% suffering from recurrent infections during their lifetime (Sobel, 2007). Beyond the physical manifestations, VVC imposes considerable psychological distress, sexual dysfunction, and a measurable decline in quality of life (Denning 2018). *Candida albicans* remains the predominant etiologic agent, though infections caused by non-*albicans* *Candida* species have been increasingly documented (Gonçalves, 2016).

In Vietnam, reported prevalence rates of *Candida* vaginitis range from 20% to 40%, reflecting variations in diagnostic methods and study populations (Nguyễn, *et al.*, 2023; Trần, *et al.*, 2020; Lê, *et al.*, 2025). However, existing evidence largely originates from urban areas, leaving the Central Highlands - characterized by distinctive cultural and environmental conditions - insufficiently studied. The region's humid climate, constrained access to gynecological services, and specific hygiene practices may collectively shape the risk profile for infection.

While previous investigations have addressed biological and behavioral determinants (Pappas, *et al.*, 2016; Phuong, *et al.*, 2024), few have explored women's subjective perceptions and lived experiences of the disease. The psychosocial

dimensions - encompassing shame, fatigue, and strain in intimate relationships - are often neglected in research dominated by quantitative paradigms (Denning, *et al.*, 2018; Benedict, *et al.*, 2022).

This study used a mixed-methods design to (1) determine the prevalence of *Candida* vaginitis and identify associated factors among women attending Tay Nguyen Regional General Hospital, and (2) explore women's perceptions and experiences. Integrating epidemiological and qualitative data provides a broader understanding of VVC as both a biomedical and psychosocial condition, informing more effective prevention and management strategies.

MATERIALS & METHODS

Study Design and Setting

A mixed-methods cross-sectional study was conducted between April and September 2025 at the Department of Obstetrics and Gynecology, Tay Nguyen Regional General Hospital, Dak Lak Province, Vietnam. The hospital serves as a regional referral center for the Central Highlands.

Participants and Sampling

Eligible participants were women aged 18 years or older who attended the gynecology outpatient department for examination of genital symptoms or routine care. Women who were menstruating at the time of examination, had received antifungal

therapy within the previous 14 days, or declined participation were excluded.

A total of 304 women were recruited through consecutive sampling. Among them, 32 participants (17 diagnosed with *Candida* vaginitis and 15 without infection) were purposively selected for in-depth qualitative interviews to ensure thematic diversity.

Dependent Variable and Clinical Assessment

The dependent variable was *Candida* vaginitis, defined by (1) the presence of at least two of three characteristic symptoms (vulvovaginal itching or burning, thick white discharge without foul odor, vulvar erythema/irritation) and (2) a positive vaginal wet-mount microscopy showing budding yeast and/or pseudohyphae. All examinations and microscopy were performed by trained clinicians/technicians following hospital protocols.

Diagnostic limitation: The wet-mount microscopy method used allows rapid detection of yeast forms but does not permit species identification and has lower sensitivity than culture or PCR. Previous studies have estimated its sensitivity to range from 40% to 60%, which may underestimate true prevalence and introduce misclassification bias if sensitivity differs across subgroups (Nguyen, et al., 2023; Tran, et al., 2020; Le, et al., 2025). This limitation is further discussed in the Discussion section.

Independent Variables

Independent variables were organized into five domains: (i) Sociodemographic characteristics: age group, residence (urban/rural), education level, occupation, and working environment; (ii) Obstetric and medical history: prior VVC diagnosis, current pregnancy, parity (≤ 2 or > 2 births), contraceptive or antibiotic use, chronic diseases, and use of corticosteroids/immunosuppressants; (iii) Personal hygiene and behavioral factors: water source, vaginal douching, genital washing frequency, post-urination cleaning, pad-changing frequency, and panty liner use; (iv) Sexual behavior and clothing habits: number of partners, condom use, genital hygiene after intercourse, underwear fabric, tight clothing, and drying location (sunlight/shade); (v) Knowledge and awareness: knowledge of *Candida* vaginitis and prior counseling on prevention.

In particular, several self-developed items were used to assess women's awareness and preventive behaviors related to *Candida* vaginitis. Operational definitions for these variables are provided below

to ensure conceptual clarity and reproducibility of the measurements:

- Knowledge about *Candida* vaginitis: coded "Yes" if participants correctly answered ≥ 2 of 3 pre-specified questions about symptoms and risk factors; otherwise "No." These questions were self-developed and non-validated.
- Received counseling on prevention: coded "Yes" if participants responded affirmatively to: "Have you ever been counseled by a health worker on how to prevent vaginal candidiasis?"; otherwise "No."

All categorical variables were coded as binary or ordinal values as appropriate.

Quantitative Data Analysis

Data were analyzed using Stata version 14. Descriptive statistics are presented as frequencies and percentages.

Bivariate associations between independent variables and *Candida* vaginitis were estimated using the `cs` command in Stata to obtain crude prevalence ratios (PR) and 95% confidence intervals (CI).

Variable selection strategy: All variables were tested in bivariate analyses. Variables with $p < 0.20$ and theoretically relevant confounders (e.g., age, education) were entered into the multivariable Poisson regression model with robust variance. A backward elimination procedure (threshold $p > 0.10$) was used to build the final model.

Model diagnostics: Multicollinearity was checked using Variance Inflation Factor (VIF); all VIF values were below 2.0, indicating no significant multicollinearity.

Qualitative Data Collection and Analysis

The qualitative component explored women's perceptions, hygiene practices, and emotional experiences related to *Candida* vaginitis. Thirty-two participants (17 diagnosed, 15 non-diagnosed) were interviewed in-depth using semi-structured guides developed from the quantitative results. All interviews were audio-recorded, transcribed verbatim, and analyzed thematically following Braun and Clarke's six-step framework. Data were coded and grouped into three overarching themes: awareness, hygiene behaviors, and lived experiences.

Representative quotes were anonymized and presented using neutral identifiers (e.g., *Female*

participant, diagnosed case / Female participant, non-diagnosed).

RESULTS

General Characteristics and Disease Burden of Participants

The study included 304 women who attended the gynecology clinic. The overall prevalence of clinically diagnosed Candida vaginitis was 22.37% (68/304), while 32.24% (98/304) were positive for Candida spp. on wet-mount microscopy (Table 1). The most common clinical symptoms were vaginal itching and abnormal discharge. However,

qualitative findings revealed that the burden of Candida vaginitis extended beyond physical discomfort, constituting an “Invisible Burden” that affected women’s self-esteem, mental well-being, and sexual relationships.

“This disease makes me lose confidence; I always feel unclean and avoid social contact.” (Female participant, diagnosed case)

“It affects not only my daily comfort but also my intimacy with my husband. It’s exhausting.” (Female participant, diagnosed case).

Table 1. Sociodemographic and clinical characteristics of participants (n = 304)

Variable		n (%)	95% CI
Age group (years)	18–24	30 (9.9)	6.8–13.8
	25–39	136 (44.7)	39.1–50.5
	≥40	138 (45.4)	39.7–51.2
Residence	Urban	90 (29.6)	24.5–35.1
	Rural	214 (70.4)	64.9–75.5
Education	< High school	121 (39.8)	34.3–45.6
	High school	105 (34.5)	29.2–40.2
	College/University	78 (25.7)	20.8–31.0
Occupation	Farming	125 (41.1)	35.5–46.9
	Housework/Small trade	70 (23.0)	18.4–28.2
	Office work	59 (19.4)	15.1–24.3
Previous Candida diagnosis		134 (44.1)	38.4–49.9
Knowledge of Candida infection		57 (18.8)	14.5–23.6
Positive wet-mount for Candida spp.		98 (32.2)	27.0–37.8
Clinically diagnosed Candida vaginitis		68 (22.4)	17.8–27.5

Screening of Associated Factors and the “Recurrent Cycle”

Univariate analysis identified several potential factors associated with Candida vaginitis (Table 2). A prior history of infection significantly increased the likelihood of recurrence (PR = 1.81; 95% CI: 1.12–2.84; p = 0.016). This finding was consistent with the qualitative theme “Recurrent

Cycle,” in which women described an exhausting pattern of relapse despite adequate treatment.

“I just wish there were a way to cure it once and for all. It keeps coming back again and again.” (Female participant, diagnosed case)

“The medicine helps for a while, but after a few weeks, the symptoms return.” (Female participant, diagnosed case).

Table 2. Univariate analysis of factors associated with Candida vaginitis (n = 304)

Factors	PR (95% CI)	p-value
Previous Candida infection (Yes vs No)	1.81 (1.12–2.84)	0.016
Pregnancy (Yes vs No)	2.35 (1.02–5.44)	0.045
≤2 childbirths (vs ≥3)	2.32 (1.22–4.22)	0.011
Drying underwear in sunlight (vs shaded area)	2.15 (1.12–4.09)	0.020
Received counseling about prevention (Yes vs No)	2.15 (1.23–3.77)	0.007

Independent Factors and Explanations for Paradoxes

Multivariable Poisson regression identified two independent predictors of Candida vaginitis: having ≤2 childbirths (PR = 2.04; 95% CI: 1.02–4.06; p = 0.043) and drying underwear in shaded

areas (PR = 0.52; 95% CI: 0.27–0.99; p = 0.048) (Table 3). Interestingly, none of the hygiene-related practices showed significant associations, a finding further illuminated by the qualitative theme “Unsuccessful Efforts.” Many participants

described repeatedly changing hygiene products and routines without success.

“I’ve tried everything — switching cleansers, changing diet, avoiding sugar — but nothing really works.” (Female participant, diagnosed case).

Table 3. Multivariable Poisson regression of independent factors associated with *Candida* vaginitis

Factors	Adjusted PR (95% CI)	p-value
≤2 childbirths (vs ≥3)	2.04 (1.02–4.06)	0.043
Drying underwear in shaded areas (vs sunlight)	0.52 (0.27–0.99)	0.048
Previous infection	1.42 (0.85–2.37)	0.176
Pregnancy	1.54 (0.65–3.69)	0.329
Counseling about prevention	1.43 (0.77–2.66)	0.253

The apparent paradox—that women who received counseling had higher infection rates - was clarified through the qualitative theme “Passive Cognition.” Women often gained awareness of *Candida* infection only after being diagnosed, meaning that the “counseled” group largely consisted of previously infected patients.

“I only learned about Candida after the doctor told me I had it.” (Female participant, diagnosed case)

“I had never heard of this disease before.” (Female participant, non-diagnosed)

This integration of quantitative and qualitative evidence reveals that preventive counseling currently reaches women after infection, emphasizing the need for proactive, community-based education programs to strengthen awareness and early prevention.

DISCUSSION

This study examined the prevalence and determinants of *Candida* vaginitis among women attending Tay Nguyen Regional General Hospital, using a mixed-methods approach that combined epidemiological analysis with qualitative exploration of women’s experiences. The findings confirm that *Candida* vaginitis remains a common condition, with a prevalence of 22.37%, and identified parity and underwear-drying practices as independent factors associated with infection. Complementing these quantitative findings, the qualitative component provided deeper contextual understanding, revealing *Candida* vaginitis not merely as a localized infection but as part of a persistent “Recurrent Cycle” and an “Invisible Burden” affecting both the physical and psychosocial well-being of affected women.

Strengths and Study Context

The principal strength of this study lies in its mixed-methods design, which enabled the integration of quantitative estimation of prevalence

and associated factors with qualitative exploration of women’s perceptions and experiences. This methodological synthesis provided both numerical and contextual insights, clarifying apparently paradoxical findings and offering a more holistic understanding of the burden of *Candida* vaginitis. Conducting the study at Tay Nguyen Regional General Hospital in Dak Lak Province—representative of Vietnam’s Central Highlands, with its distinct demographic and environmental conditions—adds further significance. By situating the investigation in this underserved region, the study addresses a critical gap in national evidence, as most previous research in Vietnam has focused primarily on urban populations (Nguyen *et al.*, 2023; Tran *et al.*, 2020; Le *et al.*, 2025). To our knowledge, this is the first study in the Central Highlands to combine quantitative and qualitative approaches in examining *Candida* vaginitis.

Interpretation of Key Findings in the Context of Existing Literature

The prevalence of *Candida* vaginitis observed in this study (22.37%) is consistent with findings from other Vietnamese provinces, including Can Tho (22.7%) and Dong Nai (22.8%) (Nguyen, *et al.* 2021; Tran, *et al.* 2020), as well as with international data from Nigeria (Kassa, *et al.*, 2023) and global systematic reviews (Denning, *et al.*, 2018). This convergence underscores the persistent and widespread nature of *Candida* infection as a continuing public health concern. The slightly lower prevalence compared with several other Vietnamese studies (Le, *et al.*, 2025; Phuong, *et al.*, 2024) may reflect differences in diagnostic methodology, as this study employed vaginal wet-mount microscopy—a method known for lower sensitivity relative to culture or molecular assays (Nguyễn, *et al.*, 2023; Trần, *et al.*, 2020).

In multivariable analysis, two independent factors were associated with infection. Women with two

or fewer childbirths had approximately twice the risk (PR = 2.04), a relationship that may reflect parity as a proxy for younger age, greater sexual activity, or hormonal contraceptive use—all recognized correlates of *Candida* vaginitis in prior research (Sobel, 2006; Pappas, et al., 2016; Gonçalves, et al., 2016).

A paradoxical association was also observed: women who dried their underwear in shaded areas showed a *lower* risk of infection (PR = 0.52) compared with those drying them in sunlight. This finding contrasts with conventional hygiene guidance (Denning et al. 2018). Qualitative insights offered a plausible explanation—indication bias—whereby women with recurrent infections (theme “Unsuccessful Efforts”) were more likely to adopt sun-drying as a medically advised preventive measure, inadvertently inflating apparent infection rates among this subgroup. This emphasizes the need for caution in interpreting behavioral correlations within cross-sectional designs.

Other hygiene-related behaviors—such as frequency of genital washing, use of cleaning agents, and sanitary pad changes—were not significantly associated with *Candida* infection. This absence of association suggests that infection risk may depend more on biological susceptibility and environmental factors than on routine hygiene practices. Qualitative accounts supported this interpretation, as many participants described persistent symptoms despite maintaining meticulous hygiene:

“I’ve tried everything... but it still doesn’t work.”
(Female participant, diagnosed case)

Such narratives underscore the limitations of hygiene-based prevention alone, particularly among women with recurrent infection, and highlight the need for more comprehensive interventions addressing behavioral, biological, and psychosocial dimensions.

Finally, the observed association between *having received counseling* and higher infection rates was clarified through the qualitative theme “Passive Cognition.” Women’s awareness of *Candida* infection often emerged only after diagnosis, rather than as part of preventive education efforts. As one participant reflected:

“I only learned about Candida after the doctor told me I had it.” (Female participant, diagnosed case)

This finding indicates that counseling primarily occurred post-diagnosis, functioning more as a marker of prior infection than as a preventive intervention. It underscores persistent deficiencies in community-based reproductive health education and early preventive outreach across Vietnam (Nguyen, et al., 2023; Phuong, et al., 2024).

LIMITATIONS

This study has several limitations. First, its cross-sectional design precludes causal inference, and the associations observed should therefore be interpreted as correlations rather than cause–effect relationships. Second, diagnosis relied solely on wet-mount microscopy, which, while simple and cost-effective, likely underestimated the true prevalence compared with culture or molecular methods (Nguyen, et al., 2023; Tran, et al., 2020; Le, et al., 2025). Third, information on behavioral and medical history variables was self-reported and may be subject to recall or social desirability bias. Finally, data on certain potential confounding factors—including type of contraceptive method, socioeconomic status, and use of electric dryers—were not collected, although these variables could influence both infection risk and hygiene behaviors.

Despite these limitations, the findings from this mixed-methods study offer several practical implications.

From a clinical perspective, the management of *Candida* vaginitis—particularly recurrent cases—should adopt a holistic approach that extends beyond pharmacologic therapy. Counseling should also address the psychosocial and relational aspects of the condition, reflecting the “Invisible Burden” experienced by affected women (Denning, et al., 2018; Sobel, 2006). From a public health perspective, reproductive health education should move from passive awareness to proactive prevention. Community-based programs targeting young, rural women need to emphasize preventive hygiene, recognition of early symptoms, and timely care-seeking behavior (Nguyen, et al., 2023; Phuong, et al., 2024). For future research, longitudinal designs and diagnostic tools with higher sensitivity—such as culture or PCR—should be employed to clarify recurrence patterns and explore paradoxical associations while accounting for potential confounders (Tran, et al., 2020; Le, et al., 2025).

Overall, this study contributes to a more comprehensive understanding of *Candida* vaginitis

in the Central Highlands of Vietnam, highlighting the interplay between biomedical, behavioral, and psychosocial factors, and emphasizing the importance of proactive, context-sensitive reproductive health interventions (Kassa, *et al.*, 2023; Mohamed, *et al.*, 2022).

CONCLUSIONS

Candida vaginitis remains a prevalent and recurrent condition among women in Vietnam's Central Highlands. The mixed-methods design of this study provided a comprehensive view that integrates both biomedical determinants and psychosocial experiences. Parity, pregnancy, and underwear-drying practices were identified as key correlates, while qualitative findings highlighted the emotional distress and social constraints that accompany recurrent infections.

Abbreviations

VVC – Vulvovaginal candidiasis; PR – Prevalence ratio; CI – Confidence interval.

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Ethics Approval and Consent to Participate

The research protocol was reviewed and approved by the Scientific Research Ethics Committee of Tay Nguyen University and received official approval from Tay Nguyen Regional General Hospital. Prior to participation, the objectives and procedures of the study were clearly explained to all participants, and written informed consent was obtained. Participant information was kept strictly confidential and used solely for research purposes. In cases where test results were positive, participants were counseled on preventive measures and referred to appropriate medical specialists for further diagnosis and treatment.

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