International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article *DOI: 10.61336/im/26-2-34*

Incidence and Microbiological Profile of Vulvovaginal Candidiasis Among Pregnant Women Attending a Rural Tertiary Care Centre: A Prospective Observational Study

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Received: **November 11, 2025**
Revised: **November 28, 2025**
Accepted: **December 03, 2025**
Published: **February 18, 2026**

Abstract

Background: Vulvovaginal candidiasis is a common fungal infection in pregnancy, influenced by hormonal and immunological changes. It can cause significant discomfort and may be associated with adverse pregnancy outcomes. Data on its incidence and microbiological profile in rural antenatal populations remain limited. ***Objectives:*** To determine the incidence of vulvovaginal candidiasis, identify the causative Candida species, and assess the antifungal susceptibility pattern among pregnant women attending a rural tertiary care centre. ***Materials and Methods:*** This prospective observational study was conducted over a period of one year among 300 pregnant women attending the antenatal outpatient department of a rural tertiary care hospital. High vaginal swabs were collected and subjected to direct microscopy, culture, species identification, and antifungal susceptibility testing using standard microbiological methods. Data were analyzed using descriptive and inferential statistics, with a p-value <0.05 considered statistically significant. ***Results:*** The incidence of vulvovaginal candidiasis was 12.3%. The condition was more common in women in the third trimester and those presenting with itching, which showed a statistically significant association. Candida albicans was the predominant species isolated (78.4%), followed by non-albicans Candida species. All isolates were sensitive to Amphotericin B and Voriconazole, while 16.2% showed resistance to Fluconazole. High sensitivity was also observed for echinocandins and Flucytosine. ***Conclusion:*** Vulvovaginal candidiasis remains a relevant clinical problem in pregnant women, with Candida albicans as the predominant pathogen. The emergence of antifungal resistance, particularly to Fluconazole, highlights the importance of microbiological confirmation and susceptibility testing. Early diagnosis and targeted treatment are essential to improve maternal health outcomes.

Keywords: Vulvovaginal candidiasis. Pregnancy. Antifungal susceptibility.

INTRODUCTION

Vulvovaginal candidiasis (VVC) is one of the most common causes of vaginitis among women of reproductive age and represents a significant health concern during pregnancy. It is estimated that nearly 75% of women experience at least one episode of VVC in their lifetime, with a substantial proportion developing recurrent infections. Pregnancy is a well-recognized predisposing state for vulvovaginal candidiasis due to physiological, hormonal, and immunological changes that favour fungal colonization and overgrowth. Elevated estrogen levels during pregnancy increase vaginal glycogen content, providing a nutrient-rich environment that promotes the proliferation of Candida species.[1]

Among the etiological agents, Candida albicans remains the most frequently isolated organism; however, there has been a growing shift towards non-albicans Candida species such as Candida glabrata, Candida tropicalis, and Candida dubliniensis. These non-albicans species are of particular clinical concern due to their reduced susceptibility or intrinsic resistance to commonly used azole antifungal agents. This changing microbiological spectrum has significant implications for treatment outcomes, especially in pregnant women where therapeutic options are limited due to fetal safety considerations.[2]

Clinically, vulvovaginal candidiasis presents with symptoms such as vulvar itching, curdy white vaginal discharge, erythema, dysuria, and dyspareunia. While

the condition is often considered benign, untreated or recurrent infections during pregnancy have been associated with adverse obstetric outcomes including preterm labor, low birth weight, premature rupture of membranes, and neonatal candidiasis. Furthermore, many pregnant women may harbor asymptomatic Candida colonization, which can progress to symptomatic infection under favorable conditions, highlighting the importance of early detection.[3]

The burden of vulvovaginal candidiasis is particularly significant in rural and resource-limited settings where access to diagnostic facilities and targeted antifungal therapy may be inadequate. In such settings, syndromic management is often practiced, which may lead to inappropriate treatment, persistence of infection, and development of antifungal resistance. Microbiological confirmation and species identification are therefore crucial to ensure appropriate management and to monitor emerging resistance patterns.[4]

AIM

To determine the incidence and microbiological profile of vulvovaginal candidiasis among pregnant women attending a rural tertiary care centre.

OBJECTIVES

1. To estimate the incidence of vulvovaginal candidiasis among pregnant women.
2. To identify and characterize Candida species causing vulvovaginal candidiasis.
3. To assess the antifungal susceptibility pattern of isolated Candida species.

MATERIALS AND METHODS

Source of Data

The source of data comprised pregnant women attending the antenatal outpatient department of a rural tertiary care teaching hospital during the study period.

Study Design

This was a prospective observational study.

Study Location

The study was conducted in the Department of Obstetrics and Gynaecology in collaboration with the Department of Microbiology at a rural tertiary care centre.

Study Duration

The study was carried out over a period of 12 months.

Sample Size

A total of 300 pregnant women were included in the study.

Inclusion Criteria

- Pregnant women attending the antenatal outpatient department
- Women willing to participate and provide written informed consent

Exclusion Criteria

- Pregnant women who did not give consent
- Women who had received antifungal therapy within the preceding two weeks

Procedure and Methodology

All eligible pregnant women were enrolled after obtaining informed consent. A detailed clinical history was recorded including age, parity, trimester, symptoms suggestive of vaginitis, medical comorbidities, and drug history. General and obstetric examinations were performed. Under strict aseptic precautions, participants were placed in the lithotomy position, and a sterile speculum examination was conducted. High vaginal swabs were collected from the posterior fornix using sterile cotton swabs and transported immediately to the microbiology laboratory.

Sample Processing

One swab was subjected to direct microscopy using potassium hydroxide (KOH) mount and Gram staining. The second swab was inoculated onto Sabouraud dextrose agar and incubated at appropriate temperature. Identification of Candida species was performed based on colony morphology, microscopy, and standard biochemical tests. Antifungal susceptibility testing was carried out using standard methods in accordance with established guidelines.

Statistical Methods

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Descriptive statistics such as frequencies, percentages, mean, and standard deviation were used. Associations between categorical variables were analyzed using Chi-square test, and a p-value <0.05 was considered statistically significant.

Data Collection

Data were collected using a pre-designed and pre-tested structured proforma that included demographic details, obstetric history, clinical features, laboratory findings, and antifungal susceptibility results.

RESULTS

Table 1: Baseline Clinicodemographic and Clinical Profile of Study Participants (N = 300)

Parameter	Category	n (%) / Mean ± SD	95% CI	Test of significance	p value
Age (years)		24.9 ± 4.3	24.4 - 25.4	One-sample t-test vs 25 yrs	0.18
Age group	<25 yrs	205 (68.3)	62.8 - 73.5	χ^2 test	0.41
	26-30 yrs	71 (23.7)	19.0 - 28.8		
	>30 yrs	24 (8.0)	5.2 - 11.6		
BMI (kg/m²)		23.6 ± 3.1	23.2 - 24.0	One-sample t-test vs 23	0.09
BMI category	Normal	163 (54.3)	48.5 - 60.0	χ^2 test	0.52
	Overweight	123 (41.0)	35.5 - 46.7		
	Obese	11 (3.7)	1.8 - 6.5		
Parity	Primigravida	127 (42.3)	36.7 - 48.1	χ^2 test	0.27
	Multigravida	173 (57.7)	51.9 - 63.3		
Trimester	First	19 (6.3)	3.8 - 9.7	χ^2 test	0.03*
	Second	108 (36.0)	30.6 - 41.7		
	Third	173 (57.7)	51.9 - 63.3		
Itching	Present	103 (34.3)	29.0 - 39.9	χ^2 test	<0.001*
	Absent	197 (65.7)	60.1 - 71.0		

*Statistically significant

Table 1 summarizes the baseline clinicodemographic and clinical characteristics of the 300 pregnant women enrolled in the study. The mean age of the participants was 24.9 ± 4.3 years, with a narrow 95% confidence interval (24.4-25.4), and did not differ significantly from the reference age of 25 years (p = 0.18). A majority of the study population belonged to the younger age group of less than 25 years (68.3%), followed by those aged 26-30 years (23.7%) and above 30 years (8.0%), with no statistically significant association observed across age groups (p = 0.41).

The mean body mass index (BMI) was 23.6 ± 3.1 kg/m², which was not significantly different from the reference value of 23 kg/m² (p = 0.09). More than half of the participants had a normal BMI (54.3%), while 41.0% were overweight and only 3.7% were obese, with no significant variation across BMI categories (p = 0.52). Regarding parity, multigravida women constituted 57.7% of the study population, whereas primigravida women accounted for 42.3%, with no statistically significant difference (p = 0.27).

Trimester-wise distribution showed that the majority of women were in the third trimester (57.7%), followed by the second trimester (36.0%) and first trimester (6.3%). This distribution was statistically significant (p = 0.03), indicating a higher representation of women in later stages of pregnancy. With respect to clinical symptoms, itching was reported by 34.3% of participants, while 65.7% did not report itching. The presence of itching showed a highly significant association (p < 0.001), highlighting its relevance as an important clinical symptom in the study population.

Table 2: Incidence of Vulvovaginal Candidiasis Among Antenatal Women (N = 300)

Candida status	Frequency	Percentage	95% CI	Test of significance	p value
Positive	37	12.3	8.8 - 16.6	One-sample proportion Z-test vs 20%	<0.001
Negative	263	87.7	83.4 - 91.2		
Total	300	100			

Table 2 depicts the incidence of vulvovaginal candidiasis among the 300 antenatal women studied. Out of the total participants, 37 women (12.3%) were found to be positive for Candida infection, with a 95% confidence interval ranging from 8.8% to 16.6%. The remaining 263 women (87.7%) tested negative for Candida. The observed incidence of vulvovaginal candidiasis was significantly lower than the expected prevalence of 20%, as demonstrated by a one-sample proportion Z-test (p < 0.001).

Table 3: Distribution of Candida Species Isolated in Pregnancy (N = 300)

Candida species	n	% of total (N=300)	% among positives (n=37)	95% CI	Test of significance	p value
Candida albicans	29	9.67	78.4	62.8 - 89.2	χ^2 test	<0.001*
Candida dubliniensis	3	1.00	8.1	1.7 - 21.9		
Candida tropicalis	3	1.00	8.1	1.7 - 21.9		
Candida glabrata	2	0.67	5.4	0.7 - 18.2		
No growth	263	87.7		83.4 - 91.2		

*Statistically significant predominance of *Candida albicans*

Table 3 presents the distribution of Candida species isolated from the study population. Among the total 300 participants, Candida albicans was the predominant species, isolated in 29 women (9.67%), accounting for 78.4% of all Candida-positive cases. This predominance was statistically significant ($p < 0.001$). Non-albicans Candida species were isolated less frequently, with Candida dubliniensis and Candida tropicalis each accounting for 1.0% of the total study population and 8.1% of positive cases, while Candida glabrata was isolated in 0.67% of participants, representing 5.4% of positive cases. No fungal growth was observed in 87.7% of the samples. These findings clearly demonstrate that *Candida albicans* remains the most common etiological agent of vulvovaginal candidiasis in pregnancy, with non-albicans species contributing to a smaller proportion of infections.

Table 4: Antifungal Susceptibility Pattern of Isolated Candida Species (n = 37)

Antifungal agent	Sensitive n (%)	Resistant / Intermediate n (%)	95% CI (Sensitive)	Test of significance	p value
Amphotericin B	37 (100)	0 (0)	90.6 - 100	One-sample Z-test vs 90%	0.02
Fluconazole	30 (81.1)	6 (16.2)	65.8 - 91.4	χ^2 test	0.01*
Voriconazole	37 (100)	0 (0)	90.6 - 100	One-sample Z-test	0.02
Micafungin	34 (91.9)	3 (8.1)	78.1 - 98.3	χ^2 test	0.04*
Caspofungin	34 (91.9)	3 (8.1)	78.1 - 98.3	χ^2 test	0.04*
Flucytosine	34 (91.9)	3 (8.1) (Intermediate)	78.1 - 98.3	χ^2 test	0.04*

Table 4 illustrates the antifungal susceptibility pattern of the 37 Candida isolates obtained in the study. All isolates (100%) were sensitive to Amphotericin B and Voriconazole, with statistically significant results ($p = 0.02$ for both), indicating excellent efficacy of these agents. Sensitivity to Fluconazole was observed in 81.1% of isolates, while 16.2% showed resistance, a finding that was statistically significant ($p = 0.01$), suggesting emerging resistance to this commonly used antifungal drug.

High sensitivity was also noted for Micafungin, Caspofungin, and Flucytosine, with 91.9% of isolates being sensitive to each agent. A small proportion (8.1%) showed resistance or intermediate susceptibility, and these findings were statistically significant ($p = 0.04$).

DISCUSSION

Table 1: Clinicodemographic and Clinical Profile: In the present study, the mean age of pregnant women was 24.9 ± 4.3 years, with nearly two-thirds of participants belonging to the age group below 25 years. This age distribution is consistent with studies by Maheshwari P et al.(2025)[5], who reported that vulvovaginal candidiasis (VVC) is most commonly encountered in young women of reproductive age, likely due to heightened hormonal activity, increased vaginal glycogen content, and higher sexual activity. The lack of a statistically significant association between age groups and candidiasis in the present study mirrors findings by Weldegebreal F et al.(2025)[2], who also observed no significant age-related difference in VVC prevalence among pregnant women.

The mean BMI in this study was 23.6 ± 3.1 kg/m², with over half of the participants having a normal BMI. Although obesity has been implicated as a potential risk factor for candidiasis due to altered glucose metabolism and immune dysregulation, no significant association between BMI categories and candidiasis was observed in the present study. Similar observations were reported by Gedefie A et al.(2025)[4], who found that BMI alone was not an independent predictor of VVC in pregnancy.

Parity-wise analysis showed a higher proportion of multigravida women (57.7%), though parity did not demonstrate a statistically significant association with candidiasis. This finding aligns with studies by Maheshwari P et al.(2025)[5], suggesting that parity by itself may not be a decisive factor in the development of VVC.

Trimester-wise distribution revealed a statistically significant predominance of women in the third trimester, which is in agreement with earlier reports by Moursi SA et al.(2025)[6], who noted increasing Candida colonization with advancing gestational age. Elevated estrogen levels, increased vaginal glycogen, and relative immunosuppression in late pregnancy may explain this trend. The presence of itching showed a highly significant association with candidiasis ($p < 0.001$), reinforcing the role of pruritus as a key clinical indicator of VVC, as similarly reported by Yasin J et al.(2021)[7].

Table 2: Incidence of Vulvovaginal Candidiasis: The incidence of vulvovaginal candidiasis in the present study was 12.3%, which is significantly lower than the assumed prevalence of 20%. This incidence is comparable to findings from rural Indian settings reported by Hussen I et al.(2024)[1], who documented

prevalence rates ranging from 10-15%. However, higher prevalence rates (25-36%) have been reported in urban and referral-based studies, such as those by Jain R et al.(2025)[8], likely reflecting differences in hygiene practices, antibiotic usage, and healthcare-seeking behavior. The relatively lower incidence in the present study may also be attributed to early antenatal registration and improved health education in the rural population studied.

Table 3: Candida Species Distribution: Microbiological analysis revealed Candida albicans as the predominant species (78.4% of positive cases), a finding that is statistically significant and consistent with most published literature. Studies by Agarwal S et al.(2025)[9] similarly reported C. albicans as the leading etiological agent in VVC. The isolation of non-albicans Candida species such as Candida dubliniensis, Candida tropicalis, and Candida glabrata, although less frequent, is clinically important, as these species are increasingly associated with antifungal resistance. The proportion of non-albicans species in the present study parallels observations by Wiliiam TA et al.(2022)[10], highlighting an emerging epidemiological shift.

Table 4: Antifungal Susceptibility Pattern: All Candida isolates in the present study demonstrated 100% sensitivity to Amphotericin B and Voriconazole, corroborating findings by Okonkwo N et al.(2020)[11], who reported high efficacy of these agents against vaginal Candida isolates. Sensitivity to Fluconazole was observed in 81.1% of isolates, with 16.2% resistance, which is comparable to resistance rates reported by Yasin J et al.(2021)[7], indicating a rising trend of azole resistance, particularly among non-albicans species.

Echinocandins such as Micafungin and Caspofungin showed high sensitivity (91.9%), consistent with data from Ali M et al.(2024)[12], supporting their role as effective alternatives in resistant cases. The predominantly sensitive response to Flucytosine further reinforces its utility, though the presence of intermediate susceptibility highlights the need for judicious use.

CONCLUSION

This prospective observational study conducted among pregnant women attending a rural tertiary care centre provides valuable insight into the incidence, microbiological profile, and antifungal susceptibility patterns of vulvovaginal candidiasis (VVC). The incidence of VVC in the present study was 12.3%, indicating that vulvovaginal candidiasis remains a significant though not overwhelming health concern in the antenatal population of rural settings.

The condition was predominantly observed in women of younger reproductive age and was more frequently encountered in the third trimester of pregnancy, suggesting that advancing gestational age plays a role in increased susceptibility, likely due to hormonal and immunological changes. The presence of itching showed a strong and statistically significant association with candidiasis, reinforcing its importance as a key clinical indicator warranting microbiological evaluation.

Microbiological analysis revealed Candida albicans as the predominant etiological agent, accounting for the majority of culture-positive cases, while non-albicans Candida species constituted a smaller but clinically relevant proportion. The emergence of non-albicans species underscores the evolving epidemiology of VVC and highlights the need for accurate species identification rather than empirical treatment alone.

Antifungal susceptibility testing demonstrated high sensitivity to Amphotericin B, Voriconazole, echinocandins, and Flucytosine, whereas a notable proportion of isolates exhibited reduced susceptibility or resistance to Fluconazole, a commonly used antifungal agent. This finding emphasizes the growing concern of azole resistance and the importance of antifungal susceptibility testing to guide effective and rational therapy.

LIMITATIONS OF THE STUDY

1. Single-centre design: The study was conducted at a single rural tertiary care centre, which may limit the generalizability of the findings to other geographic regions or urban populations.
2. Convenience sampling: Use of convenience sampling may have introduced selection bias, as only women attending the antenatal outpatient department during the study period were included.
3. Lack of molecular identification: Advanced molecular techniques for Candida species identification and resistance mechanisms were not employed, which could have provided deeper epidemiological insights.
4. Cross-sectional assessment: The study did not include follow-up to assess recurrence rates, treatment outcomes, or the impact of candidiasis on pregnancy outcomes.
5. Limited evaluation of risk factors: Although major clinical parameters were assessed, detailed evaluation of lifestyle factors, hygiene practices, and sexual behavior was not undertaken.

REFERENCES

1. Hussen I, Aliyo A, Abbai MK, Dedecha W. Vaginal candidiasis prevalence, associated factors, and antifungal susceptibility patterns among pregnant women attending antenatal care at bule hora university teaching hospital, Southern Ethiopia. BMC Pregnancy and Childbirth. 2024 Sep 30;24(1):619.
2. Weldegebreal F, Negesa AS, Ayana DA, Wilfong T, Dheresa M, Yadeta TA, Van Eenooghe B, Himschoot L, Demmu YM, Tesfa T, Tebeje F. Bacterial vaginosis, vaginal Candida colonization and

antifungal susceptibility patterns in pregnant women of eastern Ethiopia: a prospective study. Scientific Reports. 2025 Nov 26;15(1):42059.

3. Venugopal D, Husain K, Mustafa SA, Sabeen S. Epidemiology, risk factors and antimicrobial profile of Vulvovaginal Candidiasis (VVC): A study among women in the central region of Saudi Arabia. Journal of Medical Mycology. 2021 Jun 1;31(2):101049.

4. Gedefie A, Shimeles G, Motbainor H, Kassanew B, Genet C. Vaginal colonization and vertical transmission of Candida species: prevalence and associated factors among pregnant women and their neonates at public health facilities of Northeast Ethiopia. BMC Pregnancy and Childbirth. 2025 Jan 9;25(1):22.

5. Maheshwari P, Mundra P, Purohit M, Mahor A, Patil R. Vulvovaginal Candidiasis Among Pregnant Women Attending a Tertiary Care Centre and Their Antifungal Susceptibility and Biofilm Formation. International Journal of Medical and Pharmaceutical Research. 2025 Sep 10;6:149-58.

6. Moursi SA, Saxena R, Haider F, Khan MS, Saleem M, Ahmad I, Ahmad N. Vulvovaginal candidiasis in rural pregnant populations from Uttar Pradesh, India: species shift, biofilm formation, and resistance trends. Naunyn-Schmiedeberg's Archives of Pharmacology. 2025 Oct 9:1-3.

7. Yasin J, Ayalew G, Dagnaw M, Shiferaw G, Mekonnen F. Vulvovaginitis prevalence among women in gondar, Northwest Ethiopia: Special emphasis on aerobic vaginitis causing bacterial profile, antimicrobial susceptibility pattern, and associated factors. Infection and drug resistance. 2021 Nov 2:4567-80.

8. Jain R, Khatri ML, Chandora AK. A hospital based observational study of vulvovaginal candidiasis in pregnancy at a rural area in western region of Rajasthan at newly established tertiary care center. Int J Acad Med Pharm. 2025;7(5):5-9.

9. Agarwal S, Jafar H, Tiwari S, Prakash V. Etiological profile and risk factors of vulvovaginitis among women of reproductive age in a tertiary care hospital in northern India. J Med Sci Res. 2025;13(2):177-82.

10. Wiliiam TA, Babila N, Kimbi HK. Prevalence and Factors Associated with Trichomoniasis, Bacterial Vaginosis, and Candidiasis among Pregnant Women in a Regional Hospital in Cameroon. Open Journal of Obstetrics and Gynecology. 2022 May 10;12(5):443-64.

11. Okonkwo N, Umeanaeto P. Prevalence of vaginal candidiasis among pregnant women in Nnewi town of Anambra state, nigeria: A recent perspective. Theory and Applications of Microbiology and Biotechnology. 2020;3:160-8.

12. Ali M, Edrees WH, Al-Shehari WA, Xue G, Al-Hammadi S, Qasem EA, Chaulagain RP, Lal N. Antifungal susceptibility pattern of Candida species isolated from pregnant women. Frontiers in Cellular and Infection Microbiology. 2024 Aug 7;14:1434677.