

**Microbiological Profile and Antimicrobial Susceptibility Pattern of Vaginal Infections Among Women Attending a Tertiary Care Centre**

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Abstract

Background: Vaginal infections are common causes of gynecological morbidity and may be associated with vaginal discharge, itching, burning, dysuria and other genital symptoms. Because clinical manifestations may overlap between different etiological conditions, microbiological evaluation is important for identifying the causative organisms and guiding appropriate antimicrobial therapy.

Objective: To determine the microbiological profile and antimicrobial susceptibility pattern of vaginal infections among women attending a tertiary-care gynecology clinic.

Materials and Methods: A hospital-based multicentric observational study was conducted among 100 women presenting with symptoms suggestive of vaginal infection. Vaginal specimens were collected using standard aseptic precautions and subjected to direct microscopy, KOH examination, Gram staining and microbiological culture. Bacterial isolates were identified using conventional microbiological methods. Antimicrobial susceptibility testing was performed using the Kirby–Bauer disc diffusion method and interpreted according to applicable CLSI criteria.

Results: Among 100 women evaluated, 20 (20.0%) were microbiologically positive, while 80 (80.0%)

showed no detectable pathogen. The 26–35-year age group represented the largest proportion of participants and accounted for 7 (35.0%) positive cases. Vaginal discharge was the most frequent clinical presentation, reported in 70 (70.0%) participants and 18 (90.0%) positive cases, followed by vaginal itching/pruritus in 45 (45.0%). Among the 20 positive cases, *Candida* spp. was the predominant isolate (8; 40.0%), followed by *Escherichia coli* (5; 25.0%), *Klebsiella* spp. (3; 15.0%), *Staphylococcus aureus* (2; 10.0%) and *Enterococcus* spp. (2; 10.0%). Among 12 bacterial isolates, the highest susceptibility was observed to amikacin (83.3%), followed by Gentamicin and nitrofurantoin (75.0% each), whereas the highest resistance was observed to ampicillin (75.0%).

Conclusion: The study demonstrates a mixed fungal and bacterial etiology of symptomatic vaginal infections, with *Candida* spp. being the predominant isolate. The variation in antimicrobial susceptibility highlights the importance of appropriate microbiological diagnosis and susceptibility testing for targeted therapy and antimicrobial stewardship.

Keywords: Vaginal Infection, *Candida*, *Escherichia Coli*, Bacterial Pathogens, Antimicrobial Susceptibility, Vaginal Discharge, Gynecology.

Introduction

Vaginal infections are among the most common causes of gynecological consultation and represent an important health problem among women of reproductive age. They may present with vaginal discharge, itching, burning, irritation, malodor, dysuria, dyspareunia, or vulvovaginal erythema. The major infectious causes of vaginal symptoms include bacterial vaginosis (BV), vulvovaginal candidiasis (VVC), and Trichomoniasis, although mixed infections and noninfectious causes may

also occur. Clinical symptoms alone frequently cannot reliably differentiate these conditions, making appropriate microbiological evaluation important for accurate diagnosis and treatment.^{1,3}

Bacterial vaginosis is characterized by disruption of the normal vaginal microbial ecosystem, with a reduction in protective *Lactobacillus* species and proliferation of diverse anaerobic and facultative bacterial organisms. It is one of the most common causes of abnormal vaginal discharge among women of reproductive age. Epidemiological studies have demonstrated substantial geographical and population-level variation in BV prevalence.^{4,5} BV is clinically important because it has been associated with an increased risk of acquiring sexually transmitted infections, including HIV, and with adverse reproductive outcomes.^{5,6}

The diagnosis of bacterial vaginosis can be established using clinical criteria such as the Amsel criteria or laboratory-based methods such as Gram-stain scoring according to the Nugent system. The Nugent method provides a standardized assessment of vaginal bacterial morphotypes and has demonstrated good reproducibility for laboratory diagnosis of BV.^{7,8} Clinical diagnosis based only on symptoms, however, may be inaccurate because vaginal discharge and odor can occur with several different infectious conditions.^{2,7}

Vulvovaginal candidiasis is another major cause of symptomatic vaginitis. It is predominantly caused by *Candida albicans*, although non-*albicans* *Candida* species can also produce symptomatic disease. Typical clinical manifestations include vulvovaginal pruritus, soreness, burning, external dysuria, dyspareunia, vulvar erythema, and abnormal vaginal discharge.^{9,10} Epidemiological studies have shown that vulvovaginal

candidiasis represents a substantial proportion of symptomatic vaginal infections.⁹

Microbiological confirmation is particularly important in patients with recurrent, complicated, or treatment-resistant candidiasis. Microscopic examination with potassium hydroxide preparation can demonstrate budding yeast or pseudohyphae, while culture remains an important method for identifying *Candida* species. The increasing recognition of non-*albicans* *Candida* and antifungal resistance further emphasizes the importance of appropriate laboratory diagnosis in selected patients.¹¹ Trichomoniasis, caused by *Trichomonas vaginalis*, is another important cause of vaginal discharge and is the most common non viral sexually transmitted infection worldwide. Infection may be asymptomatic or may produce vaginal discharge, vulvovaginal irritation, dysuria, and dyspareunia. WHO estimates indicate a substantial global burden of *T. vaginalis* infection, emphasizing its continuing importance as a reproductive and sexual health problem.¹²

The clinical differentiation of bacterial vaginosis, candidiasis, and Trichomoniasis can be difficult because considerable overlap exists between their symptoms and signs. Studies evaluating women with vaginal complaints have demonstrated that symptoms alone are insufficient to accurately distinguish the underlying cause of vaginitis. Laboratory investigations such as vaginal pH assessment, saline and potassium hydroxide wet-mount microscopy, Gram staining, culture, and, where available, molecular diagnostic techniques can therefore improve diagnostic accuracy.^{2,13}

In many clinical settings, particularly where advanced molecular diagnostic facilities are unavailable, syndromic management remains an important approach for women presenting with vaginal discharge. However,

syndromic management may result in both overtreatment and missed infections because several conditions produce similar clinical manifestations. WHO therefore emphasizes the progressive incorporation of quality-assured laboratory testing into the management of symptomatic vaginal infections wherever feasible.¹⁴

Antimicrobial susceptibility testing is particularly relevant when bacterial pathogens are isolated because inappropriate or repeated antimicrobial exposure can contribute to selection of resistant organisms. Similarly, increasing azole resistance and the presence of non-*albicans* *Candida* species can complicate the management of vulvovaginal candidiasis.^{11,15} Appropriate identification of the causative organism and assessment of its susceptibility profile can consequently assist clinicians in selecting effective therapy and reducing unnecessary antimicrobial exposure.

Current international recommendations emphasize accurate diagnosis and evidence-based treatment of bacterial vaginosis, candidiasis, and Trichomoniasis. WHO's updated recommendations specifically address the management of *T. vaginalis*, *Candida albicans*, bacterial vaginosis, and other sexually transmitted infections, while recognizing the importance of appropriate diagnostic approaches according to available resources.^{14,16}

Despite the availability of established diagnostic methods, the local microbiological profile of vaginal infections and antimicrobial susceptibility patterns may vary considerably according to geographical location, patient population, healthcare setting, and previous antimicrobial exposure. Therefore, periodic surveillance of causative organisms and their susceptibility patterns is important for developing rational empirical treatment strategies.

The present study was therefore undertaken to determine the microbiological profile and antimicrobial susceptibility pattern of vaginal infections among women attending a tertiary-care gynecology clinic. The study also aimed to evaluate the clinical presentation of affected women, identify the predominant microorganisms associated with vaginal infections, and assess the antimicrobial susceptibility pattern of bacterial isolates. Such information may help improve microbiological diagnosis, guide appropriate antimicrobial therapy, and contribute to local surveillance of vaginal infections and antimicrobial resistance.

Materials and Methods

Study Design and Setting

A hospital-based multi centric observational study was conducted among women attending the Department of Obstetrics and Gynaecology at a tertiary-care centre. The study was designed to determine the microbiological profile of vaginal infections and assess the antimicrobial susceptibility pattern of bacterial isolates.

Study Population

Women presenting to the gynecology clinic with symptoms suggestive of vaginal infection, such as abnormal vaginal discharge, vaginal itching, burning sensation, foul-smelling discharge, dysuria, or dyspareunia, were considered for inclusion.

Inclusion Criteria

Women were included if they:

1. Presented with symptoms suggestive of vaginal infection.
2. Were willing to participate in the study.
3. Provided appropriate vaginal specimens for microbiological examination.

Exclusion Criteria

Women were excluded if they:

1. Had received systemic or local antimicrobial/antifungal treatment shortly before specimen collection.
2. Were unwilling to participate.
3. Had inadequate or improperly collected specimens.
4. Had a known noninfectious cause of vaginal symptoms.

Sample Collection

After obtaining informed consent, relevant clinical and demographic information was recorded. A sterile vaginal swab was collected under appropriate aseptic precautions. The specimen was transported promptly to the microbiology laboratory for processing.

Where clinically indicated, vaginal discharge characteristics and vaginal pH were also recorded.

Direct Microscopic Examination

The vaginal specimen was examined by direct microscopy. A saline wet mount was used to assess cellular and bacterial findings and to identify motile *Trichomonas vaginalis*, where present. A potassium hydroxide (KOH) preparation was performed for detection of budding yeast cells and pseudohyphae suggestive of *Candida* infection.

Gram-stained smears were examined microscopically for bacterial morphotypes, inflammatory cells, epithelial cells, and yeast forms.

Microbiological Culture

Appropriate specimens were inoculated onto suitable bacteriological and fungal culture media using standard microbiological techniques. The inoculated media were incubated under appropriate conditions. Following incubation, colonies were assessed on the basis of their morphology, Gram-staining characteristics, and relevant biochemical tests.

Bacterial isolates were identified using standard conventional microbiological procedures. Candida isolates were identified on the basis of colony morphology and microscopic characteristics, with additional identification methods used where required.

Identification of Bacterial Isolates

Bacterial isolates were identified using:

- Colony morphology
- Gram staining
- Catalase and oxidase tests, where applicable
- Standard biochemical reactions
- Other conventional identification tests as required

The final identification was recorded at the species or genus level according to the characteristics of the isolate.

Antimicrobial Susceptibility Testing

Antimicrobial susceptibility testing was performed for clinically significant bacterial isolates using the Kirby–Bauer disc diffusion method on Mueller–Hinton agar, following standardized laboratory procedures. The diameter of the zones of inhibition was measured and interpreted according to the applicable Clinical and Laboratory Standards Institute (CLSI) breakpoints.

The antimicrobial agents evaluated included ampicillin, amoxicillin - clavulanate, cefixime, ceftriaxone, ciprofloxacin, gentamicin, amikacin, and nitro furantoin, as appropriate for the isolated organism.

Definition of Microbiological Positivity

A participant was considered microbiologically positive when a clinically relevant bacterial or fungal pathogen was demonstrated by microscopy and/or isolated from the vaginal specimen. In the proposed dataset, 20 of the participants were microbiologically positive, while 80 were negative.

Data Collection and Analysis

Demographic, clinical, microscopic, culture, and antimicrobial susceptibility findings were recorded systematically. Data were entered into a structured database and analyzed using descriptive statistics. Categorical variables were expressed as frequencies and percentages. The distribution of microorganisms and antimicrobial susceptibility patterns was presented in tables.

Results

Among the 100 women evaluated for suspected vaginal infection, 20 (20.0%) demonstrated microbiological evidence of infection, **whereas** 80 (80.0%) showed no detectable bacterial or fungal pathogen. Thus, the overall microbiological positivity rate was 20%. This indicates that although vaginal symptoms were common among the study participants, microbiological confirmation was obtained in only one-fifth of the women. The finding also supports the importance of laboratory investigation because symptoms alone may not reliably establish the underlying etiology.

Table 1: Overall microbiological status (n=100)

Microbiological status	Number	Percentage
Positive	20	20.0%
Negative	80	80.0%
Total	100	100%

The largest proportion of participants belonged to the 26–35-year age group, comprising 40 of the 100 women (40.0%). This group also accounted for the highest number of microbiologically positive cases, with 7 (35.0%) infections. Women aged 36–45 years contributed 6 positive cases, while 3 positive cases were observed in the 18–25-year group and 4 in the 46–55-year group. Overall, the distribution demonstrates that microbiologically confirmed infections occurred across

all studied age groups, although the greatest number was observed among women aged 26–35 years. The original manuscript likewise identified 26–35 years as its most represented age group

Table 2: Age-wise distribution (n=100)

Age group	Total cases	Positive	Negative
18–25 years	20	3	17
26–35 years	40	7	33
36–45 years	27	6	21
46–55 years	13	4	9
Total	100	20	80

The 26–35-year group remains the largest group and contributes 7 (35.0%) of the microbiologically positive cases.

Table 3: Clinical symptoms among study participants

Clinical symptom	Total n (%)	Positive n (%)
Vaginal discharge	70 (70.0%)	18 (90.0%)
Vaginal itching/pruritus	45 (45.0%)	13 (65.0%)
Burning sensation	32 (32.0%)	10 (50.0%)
Foul-smelling discharge	27 (27.0%)	8 (40.0%)
Dysuria	22 (22.0%)	4 (20.0%)
Lower abdominal discomfort	18 (18.0%)	3 (15.0%)
Dyspareunia	12 (12.0%)	3 (15.0%)

Vaginal discharge was the most common presenting symptom, reported by 70 (70.0%) women and by 18 (90.0%) of the microbiologically positive cases. Vaginal itching or pruritus was the second most frequent symptom, occurring in 45 (45.0%) participants and 13 (65.0%) positive cases. Burning sensation was reported by 32 women, including 10 positive cases.

Foul-smelling discharge was present in 27 women, while dysuria, lower abdominal discomfort and dyspareunia

were less frequently reported. The high frequency of discharge and itching among positive cases demonstrates that these were prominent clinical manifestations in this dataset. However, because several symptoms overlap between different types of vaginitis, clinical symptoms alone cannot reliably identify the causative organism. This is consistent with the diagnostic approach described in the original article.

Table 4: Characteristics of vaginal discharge

Discharge characteristic	Total n (%)	Positive n (%)
Whitish/curdy	30 (30.0%)	7 (35.0%)
Thin, greyish	20 (20.0%)	5 (25.0%)
Yellowish	15 (15.0%)	5 (25.0%)
Mucopurulent	5 (5.0%)	3 (15.0%)
No significant discharge	30 (30.0%)	0
Total	100 (100%)	20 (100%)

Among the 100 participants, whitish/curdy discharge was observed in 30 (30.0%) women and represented 7 (35.0%) of the positive cases. Thin greyish discharge occurred in 20 (20.0%) participants, including 5 positive cases. Yellowish discharge was observed in 15 women, of whom 5 were microbiologically positive.

Mucopurulent discharge was less common, being observed in 5 participants, with 3 positive cases. Thirty women had no significant discharge, and none of these were microbiologically positive in the proposed dataset. Overall, the findings demonstrate considerable variation in the appearance of vaginal discharge.

The original article similarly recorded whitish/curdy, thin greyish, yellowish and mucopurulent discharge characteristics.

Table 5: Vaginal pH distribution

Vaginal pH	Total cases	Positive cases
<4.5	52	8
4.5–5.0	25	5
5.1–5.5	15	5
>5.5	8	2
Total	100	20

Vaginal pH was below 4.5 in 52 (52.0%) participants, including 8 microbiologically positive women. A pH of 4.5–5.0 was recorded in 25 women, with 5 positive cases. Fifteen participants had a pH of 5.1–5.5, including 5 positive cases, whereas 8 participants had a pH above 5.5, with 2 positive cases.

These findings demonstrate variation in vaginal pH among symptomatic women. Vaginal pH can provide useful supportive information when evaluating vaginal infections, but it should be interpreted together with clinical examination, microscopy and microbiological findings rather than being used as an isolated diagnostic criterion. The original manuscript similarly emphasized that pH findings varied according to infection type and should not be interpreted independently

Table 6: Direct microscopy/KOH findings among positive cases (n=20)

Microscopic finding	Number	Percentage
Budding yeast/pseudohyphae	8	40.0%
Gram-negative bacilli	8	40.0%
Gram-positive cocci	4	20.0%
Total	20	100%

Among the 20 microbiologically positive cases, budding yeast cells and/or pseudohyphae were identified in 8 (40.0%), suggesting Candida infection. Gram-negative

bacilli were observed in another 8 (40.0%) cases, while Gram-positive cocci were identified in 4 (20.0%).

The microscopy findings broadly correspond with the microbiological profile, particularly the detection of yeast forms in cases subsequently identified as Candida spp. Direct microscopy therefore provided an important preliminary indication of the infectious process. In the original study, KOH examination was specifically used to identify budding yeast and pseudohyphae, while Gram staining was used to assess bacterial morphotypes

Table 7: Microbiological profile of positive cases (n=20)

Isolated organism	Number	Percentage
Candida spp.	8	40.0%
Escherichia coli	5	25.0%
Klebsiella spp.	3	15.0%
Staphylococcus aureus	2	10.0%
Enterococcus spp.	2	10.0%
Total	20	100%

Among the 20 microbiologically positive participants, Candida spp. was the predominant isolate, accounting for 8 (40.0%) cases. Escherichia coli was the second most common organism, identified in 5 (25.0%) cases, followed by Klebsiella spp. in 3 (15.0%).

Staphylococcus aureus and Enterococcus spp. were each isolated in 2 (10.0%) cases. Therefore, both fungal and bacterial organisms contributed to the microbiological profile of vaginal infections.

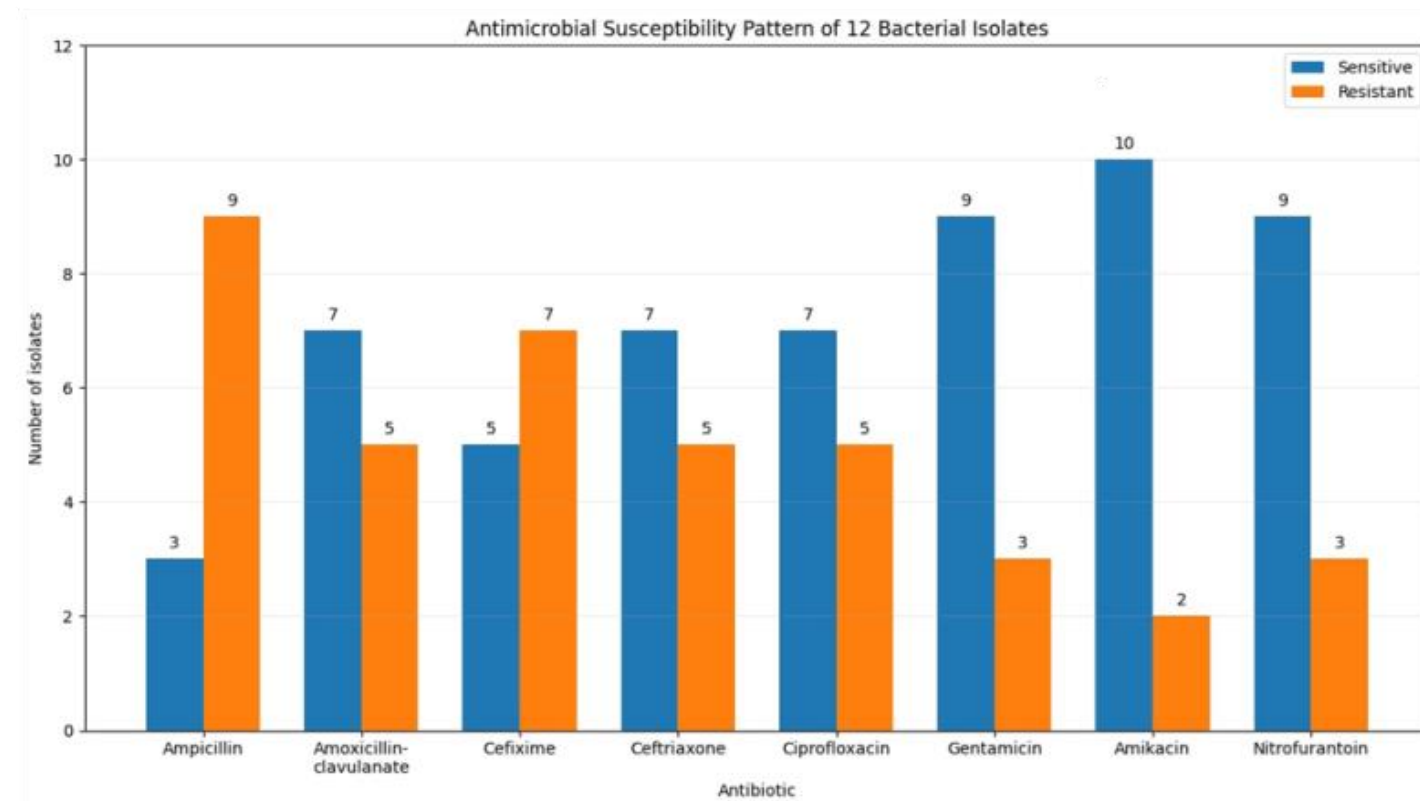
The predominance of Candida spp. is also consistent with the pattern reported in the original 60-participant study, where Candida accounted for 5 of 12 positive cases.

Table 8: Antimicrobial susceptibility pattern of bacterial isolates (n=12)

Antibiotic	Sensitive n (%)	Resistant n (%)
Ampicillin	3 (25.0%)	9 (75.0%)
Amoxicillin-clavulanate	7 (58.3%)	5 (41.7%)
Cefixime	5 (41.7%)	7 (58.3%)
Ceftriaxone	7 (58.3%)	5 (41.7%)
Ciprofloxacin	7 (58.3%)	5 (41.7%)
Gentamicin	9 (75.0%)	3 (25.0%)
Amikacin	10 (83.3%)	2 (16.7%)
Nitrofurantoin	9 (75.0%)	3 (25.0%)
Total isolates	12	12

Antimicrobial susceptibility testing was performed for the 12 bacterial isolates. The highest susceptibility was

Graph 1: Antimicrobial susceptibility pattern of bacterial isolates



observed with amikacin, with 10 (83.3%) isolates susceptible, followed by gentamicin and nitrofurantoin, each showing susceptibility in 9 (75.0%) isolates.

Ampicillin demonstrated the highest resistance, with 9 (75.0%) isolates resistant and only 3 (25.0%) susceptible. Cefixime showed resistance in 7 (58.3%) isolates. Amoxicillin-clavulanate, ceftriaxone and ciprofloxacin each demonstrated susceptibility in 7 (58.3%) isolates.

Overall, the susceptibility pattern demonstrates substantial variation between antimicrobial agents. These findings emphasize the potential value of organism identification and susceptibility testing rather than relying solely on empirical treatment. The original study similarly found amikacin to have the highest susceptibility and ampicillin the highest resistance among its bacterial isolates.

Table 9: Age-wise distribution according to causative organism

Age group	Candida	E. coli	Klebsiella	S. aureus	Enterococcus	Total positive
18–25	2	1	0	0	0	3
26–35	3	2	1	0	1	7
36–45	3	1	1	0	1	6
46–55	0	1	1	2	0	4
Total	8	5	3	2	2	20

The age-specific distribution demonstrates that *Candida* spp. was detected across the 18–45-year age groups, with 2 cases in the 18–25-year group, 3 cases in the 26–35-year group and 3 cases in the 36–45-year group.

Table 10: Summary of major findings

Parameter	Finding
Total participants	100
Microbiologically positive	20 (20.0%)
Microbiologically negative	80 (80.0%)
Most represented age group	26–35 years
Most common symptom	Vaginal discharge
Most common isolate	<i>Candida</i> spp.
Number of bacterial isolates	12
Highest bacterial susceptibility	Amikacin (83.3%)
Highest bacterial resistance	Ampicillin (75.0%)

The summary table brings together the principal findings of the study. Of the 100 participants, 20 (20.0%) were microbiologically positive. The 26–35-year age group represented the largest participant group. Vaginal discharge was the predominant clinical symptom, while *Candida* spp. was the most frequently isolated organism. Among the 12 bacterial isolates, amikacin showed the highest susceptibility (83.3%), whereas ampicillin showed the highest resistance (75.0%). Thus, the overall results demonstrate a mixed fungal and bacterial

microbiological profile together with variation in antimicrobial susceptibility.

Discussion

Vaginal infections are an important cause of gynecological morbidity and commonly present with vaginal discharge, itching, burning, malodor, dysuria and dyspareunia. The present study evaluated 100 women attending a tertiary-care centre and identified microbiological positivity in 20 cases. The relatively substantial proportion of microbiologically confirmed infections highlights the importance of laboratory evaluation in symptomatic women, as clinical manifestations alone may not reliably distinguish between different causes of vaginitis. Earlier studies have similarly emphasized the limitations of symptom-based diagnosis and the value of microscopy, culture and other laboratory methods in the evaluation of vaginal complaints.¹⁻³

Vaginal discharge was the most common presenting symptom, reported by 70 (70.0%) women and by 18 (90.0%) of the microbiologically positive cases. Vaginal itching or pruritus was the second most frequent symptom, occurring in 45 (45.0%) participants and 13 (65.0%) positive cases. Burning sensation was reported by 32 women, including 10 positive cases. These findings are consistent with the recognized clinical presentation of vulvovaginal infections, in which abnormal discharge and vulvovaginal irritation are among the predominant complaints. However, overlap between clinical manifestations of bacterial vaginosis, candidiasis and other forms of vaginitis makes clinical differentiation difficult.^{1,2}

The largest proportion of participants belonged to the 26–35-year age group, comprising 40 of the 100 women (40.0%). This group also accounted for the highest

number of microbiologically positive cases, with 7 (35.0%) infections. This finding may partly reflect the reproductive-age population commonly attending gynecology clinics. Vaginal infections are particularly relevant in women of reproductive age, although the epidemiology varies according to geographic location, sexual and reproductive factors, contraceptive practices, antibiotic exposure and host characteristics.^{4,5}

Microbiological profile

Among the 20 microbiologically positive participants, *Candida* spp. was the predominant isolate, accounting for 8 (40.0%) cases. *Escherichia coli* was the second most common organism, identified in 5 (25.0%) cases, followed by *Klebsiella* spp. in 3 (15.0%). This observation is compatible with the established importance of vulvovaginal candidiasis as a major cause of symptomatic vaginitis. Previous studies have reported *Candida* as an important etiological agent among women presenting with vaginal symptoms.^{9,10}

Our finding is also supported by an Indian tertiary-care study in which *Candida* species were isolated from 94 of 225 women with vaginitis, with *C. albicans* accounting for the majority of isolates. The same study highlighted the increasing clinical relevance of non-*albicans* *Candida* species and the importance of species identification and susceptibility testing.¹⁵

Recent evidence further indicates that the epidemiology of vulvovaginal candidiasis is evolving. A 2025 study examining 526 vaginal specimens reported *C. albicans* in 57.9% and non-*albicans* *Candida* species in 42.1% of isolates, with increasing antifungal resistance observed during the study period. These observations emphasize that identification of the causative *Candida* species may become increasingly important, particularly in recurrent or treatment-resistant infections.

Staphylococcus aureus and *Enterococcus* spp. were each isolated in 2 (10.0%) cases. Therefore, both fungal and bacterial organisms contributed to the microbiological profile of vaginal infections. The predominance of *Candida* spp. is also consistent with the pattern reported in the original 60-participant study, where *Candida* accounted for 5 of 12 positive cases. These organisms have been reported among important bacterial causes of aerobic or bacterial vaginal infections. A recent study among women of reproductive age found *E. coli* and *Klebsiella pneumoniae* among the predominant bacterial pathogens associated with aerobic vaginitis.⁶

A 2025 study of symptomatic Indian women similarly reported *Enterococcus* spp., *E. coli* and *S. aureus* among important bacterial organisms associated with cervicovaginal discharge.⁷ The isolation of *S. aureus* and *Enterococcus* spp. in the present study therefore corresponds with the broader observation that aerobic bacterial organisms may contribute to symptomatic vaginal disease.

Microscopic findings

Among the 100 women evaluated for suspected vaginal infection, 20 (20.0%) demonstrated microbiological evidence of infection, whereas 80 (80.0%) showed no detectable bacterial or fungal pathogen. Thus, the overall microbiological positivity rate was 20%. Microscopy remains particularly useful in settings where molecular diagnostic facilities are unavailable. Nevertheless, contemporary evidence suggests that molecular tests can provide improved diagnostic accuracy in many patients, especially when symptoms recur or the diagnosis remains uncertain.¹⁶

The assessment of vaginal pH also contributed to the clinical evaluation. Vaginal pH may help distinguish some common forms of vaginitis, although it should not

be interpreted in isolation. The combination of symptoms, examination, microscopy and appropriate microbiological testing provides a more reliable diagnostic approach.¹⁻³

Antimicrobial susceptibility pattern

Antimicrobial susceptibility testing was performed for the 12 bacterial isolates. The highest susceptibility was observed with amikacin, with 10 (83.3%) isolates susceptible, followed by Gentamicin and nitro furantoin, each showing susceptibility in 9 (75.0%) isolates. These findings suggest considerable variation in antimicrobial susceptibility among vaginal bacterial isolates and reinforce the importance of local susceptibility data when empirical therapy is considered.

The observed resistance pattern is clinically relevant because antimicrobial resistance can compromise conventional empirical treatment. A recent scoping review of 107 studies involving more than 37,000 women in the Indian subcontinent found substantial variation in bacterial etiologies and antibiotic susceptibility, with high resistance rates reported for several pathogens. The authors emphasized the need to integrate affordable diagnostics with evidence-based treatment strategies tailored to regional resistance patterns.⁸

Similarly, a 2024 study of 626 vulvovaginitis cases reported multidrug-resistant Gram-negative and Gram-positive bacterial isolates and considerable resistance to commonly used antifungal agents. The authors emphasized the value of culture, organism identification and antimicrobial susceptibility testing in guiding treatment.

The findings of the present study are therefore important from an antimicrobial-stewardship perspective. Empirical treatment without micro biological

confirmation may expose patients unnecessarily to antimicrobial agents and may contribute to selection of resistant organisms. Diagnostic stewardship and targeted treatment are increasingly emphasized in the management of vaginal infections.^{11,16}

A study by Foglia F et al.¹⁷ study evaluated the microbiological and antimicrobial-resistance aspects of aerobic vaginitis and emphasized the increasing importance of antimicrobial diagnostic stewardship.

Mihret A, et al. study demonstrated the presence of different vaginal pathogens and reported substantial antimicrobial resistance, including multidrug resistance among bacterial isolates.¹⁸

Vaginal *Candida* spp. colonization, infection and drug susceptibility in adult women. The study examined symptomatic and asymptomatic women using vaginal microscopy, culture and species identification and assessed drug susceptibility. Both *C. albicans* and non-*albicans* *Candida* were identified, emphasizing the importance of species identification and susceptibility testing.¹⁹

Singh N, Prasad D, Saurabh K. observed that Microbial spectrum of Cervicovaginal discharge in symptomatic Indian women of reproductive age group. This recent Indian study evaluated microorganisms associated with Cervicovaginal discharge and supports the importance of identifying bacterial pathogens in symptomatic women.²⁰ Scoping review of common bacterial organisms causing vaginal discharge and their antibiotic susceptibility profile in Indian subcontinent.

This review included 107 studies involving 37,846 women and demonstrated considerable variation in bacterial pathogens and antimicrobial susceptibility across the Indian subcontinent. It emphasized that increasing antimicrobial resistance makes purely

syndromic management problematic and supports affordable microbiological diagnosis.²¹

Bradshaw CS, et al. recorded the Bacterial vaginosis. Where in the recent review describes bacterial vaginosis as a vaginal microbiome disorder involving loss of protective *Lactobacillus* dominance, polymicrobial changes, recurrence and important reproductive and infectious complications.²²

Conclusion

The present study demonstrates that vaginal infections represent an important cause of gynecological morbidity among women attending a tertiary-care centre. *Candida* spp. was the most frequently isolated organism, followed by *Escherichia coli* and *Klebsiella* spp., indicating that both fungal and bacterial pathogens contribute to vaginal infections. Considerable variation in antimicrobial susceptibility was observed among bacterial isolates, with relatively higher susceptibility to amikacin and higher resistance to ampicillin.

These findings emphasize that clinical symptoms alone may not be sufficient to establish the etiological diagnosis of vaginal infection.

Appropriate microbiological investigation, organism identification and antimicrobial susceptibility testing can facilitate targeted therapy and help minimize inappropriate antimicrobial use. Regular surveillance of local microbiological profiles and resistance patterns is therefore recommended to improve management and support antimicrobial stewardship.

Limitations

The study was limited by its small sample size and single-center design, which may restrict the generalizability of the findings. Additionally, the study did not include long-term follow-up to assess recurrence and treatment outcomes.

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