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PREVALENCE OF BACTERIAL VAGINOSIS, VULVOVAGINAL CANDIDIASIS, AND TRICHOMONIASIS IN REPRODUCTIVE-AGE WOMEN: A MICROBIOLOGICAL AND CLINICAL CORRELATION STUDY

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ABSTRACT

Background: Lower genital tract infections are common among women of reproductive age and represent an important public health concern. Bacterial vaginosis (BV), vulvovaginal candidiasis (VVC), and trichomoniasis are among the major causes of vaginal discharge, itching, irritation and discomfort. Their clinical manifestations frequently overlap, making microbiological investigations essential for accurate diagnosis.

Aim: To determine the prevalence of bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis among women of reproductive age and to evaluate their association with clinical manifestations.

Materials and Methods: A proposed hospital-based cross-sectional observational study included 100 women of reproductive age. Detailed demographic and clinical information was collected. Vaginal specimens were evaluated using appropriate microbiological methods, including vaginal pH assessment, saline wet mount, 10% potassium hydroxide preparation, Gram staining and fungal culture, as applicable. Bacterial vaginosis was assessed using Amsel criteria and/or Nugent scoring, vulvovaginal candidiasis through microscopic examination and fungal culture, and trichomoniasis through wet mount and appropriate confirmatory testing.

Results: Among the 100 women included in the illustrative dataset, 14 (14%) demonstrated microbiological evidence of genital infection, whereas 86 (86%) were negative. Bacterial vaginosis was the most frequently identified infection, accounting for 6 cases (6%), followed by vulvovaginal candidiasis in 5 cases (5%) and trichomoniasis in 3 cases (3%). The majority of positive cases belonged to the 26–35 years age group. Vaginal discharge was the most frequently reported clinical manifestation, followed by vaginal itching and foul-smelling discharge.

Conclusion: Bacterial vaginosis was the predominant infection among the three conditions

considered in this proposed dataset. The findings emphasize the importance of combining clinical assessment with microbiological investigations for accurate identification of genital infections.

Keywords: Bacterial vaginosis, Vulvovaginal candidiasis, Trichomoniasis, Vaginal discharge, Microbiological diagnosis, Reproductive-age women.

INTRODUCTION

Female genital tract infections are among the most frequently encountered conditions in gynecological practice, particularly among women of reproductive age. These infections may present with vaginal discharge, itching, irritation, burning sensation, malodour and discomfort. Among the common causes of vaginal infections, bacterial vaginosis (BV), vulvovaginal candidiasis (VVC) and trichomoniasis are particularly important because of their overlapping clinical manifestations and different underlying etiological mechanisms [1,2].

The vaginal microbiota plays an essential role in maintaining the physiological health of the female reproductive tract. Under normal conditions, Lactobacillus species constitute the predominant vaginal microorganisms and contribute to maintaining an acidic vaginal environment through lactic acid production. This acidic environment provides protection against the excessive growth of potentially pathogenic microorganisms. Alterations in the normal vaginal microbiota may result in microbial imbalance, leading to the development of various genital tract infections [3,4].

Bacterial vaginosis is a polymicrobial vaginal dysbiosis characterized by a reduction in protective Lactobacillus species and an increase in anaerobic microorganisms, including Gardnerella vaginalis, Prevotella species, Mobiluncus species and other bacterial communities. It is one of the common causes of abnormal vaginal discharge among reproductive-age women. BV may occur with or without symptoms and has been associated with adverse reproductive and gynecological outcomes [5,6].

The diagnosis of bacterial vaginosis is commonly established using Amsel criteria or Nugent scoring. Amsel criteria involve the presence of homogeneous vaginal discharge, vaginal pH greater than 4.5, a positive whiff test and clue cells on microscopic examination. At least three of these four criteria are required for a clinical diagnosis. Nugent scoring evaluates bacterial morphotypes on Gram-stained vaginal smears and is widely used as a laboratory reference method [7,8].

Vulvovaginal candidiasis is another common genital infection caused predominantly by Candida albicans, although non-albicans Candida species may also contribute to infection. It commonly presents with vulvovaginal itching, irritation, erythema, soreness and thick curdy vaginal discharge. Factors such as antibiotic exposure, diabetes mellitus, pregnancy and alterations in host immunity may contribute to the development of candidiasis [9,10].

Microscopic examination of vaginal discharge using saline and potassium hydroxide preparations is routinely performed for the identification of fungal elements. The presence of budding yeast cells, pseudohyphae or hyphae supports the diagnosis. Fungal culture on appropriate media, particularly Sabouraud dextrose agar, may be performed for further confirmation and identification of Candida species. Culture is particularly useful in recurrent or complicated infections [11].

Trichomoniasis is a sexually transmitted infection caused by the flagellated protozoan Trichomonas vaginalis. It is an important cause of vaginal discharge and may present with irritation, itching, dysuria and malodorous discharge. Some infected women may remain asymptomatic, contributing to ongoing transmission within the community [12,13].

The diagnosis of trichomoniasis can be established through the demonstration of motile trophozoites in a freshly prepared saline wet mount. However, the sensitivity of conventional wet mount microscopy is limited and decreases with delays in specimen examination. Nucleic acid amplification tests provide greater diagnostic sensitivity and are preferred where available [14].

The clinical presentation of these three infections frequently overlaps. Vaginal discharge, itching, irritation and discomfort may occur in more than one condition, making diagnosis based exclusively on symptoms unreliable. Therefore, appropriate microbiological investigations are necessary to differentiate bacterial vaginosis, candidiasis and trichomoniasis and to guide appropriate management [15,16].

Studies conducted in India have demonstrated considerable variation in the prevalence of these infections across different geographical regions and patient populations. Differences in socioeconomic conditions, personal hygiene practices, sexual behaviour, healthcare-seeking patterns and diagnostic methodologies may contribute to this variation [17,18].

Furthermore, the presence of asymptomatic infections highlights the limitations of relying exclusively on clinical symptoms. Microbiological screening and etiological diagnosis may help identify infections that would otherwise remain undetected. A study from India evaluating self-collected and physician-collected vaginal specimens also demonstrated the importance of laboratory-based approaches for identifying the causes of vaginal discharge [19,20].

The relationship between vaginal infections and clinical symptoms is clinically important because inappropriate empirical treatment may result in persistent symptoms, recurrent infections and unnecessary antimicrobial exposure. A systematic diagnostic approach involving clinical examination, microscopy and appropriate culture techniques can improve diagnostic accuracy [21,22].

Considering the importance of genital infections among reproductive-age women, the present study was designed to evaluate the prevalence of bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis and to correlate microbiological findings with clinical manifestations. The study also aims to identify the predominant infection and describe the age-wise distribution of microbiologically confirmed cases [23–25].

AIM AND OBJECTIVES

Aim:

To determine the prevalence of bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis among women of reproductive age.

Objectives:

1. To determine the prevalence of bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis.
2. To identify the predominant genital infection among the study participants.
3. To evaluate the association between clinical symptoms and microbiological findings.
4. To assess the age-wise distribution of genital infections.
5. To evaluate the importance of microbiological investigations in the diagnosis of genital infections.

MATERIALS AND METHODS

Study Design

A hospital-based cross-sectional observational study.

Study Setting

Department of Microbiology in collaboration with the Department of Obstetrics and Gynaecology at a tertiary care teaching hospital.

Study Duration

To be specified according to the actual study period.

Sample Size

A total of 100 women of reproductive age were included in the proposed study dataset.

Study Population

Women aged 18–45 years attending the outpatient department with or without symptoms suggestive of lower genital tract infection.

Inclusion Criteria

1. Women aged 18–45 years.
2. Women presenting with vaginal discharge, itching, irritation or other genital complaints.
3. Women without genital symptoms who consent to participate in the study.
4. Women willing to undergo clinical examination and microbiological investigations.
5. Women providing written informed consent.

Exclusion Criteria

1. Women below 18 years and above 45 years of age.
2. Women who had received systemic antibiotics, antifungal or antiprotozoal treatment shortly before specimen collection, according to the predefined study protocol.
3. Women with active menstrual bleeding at the time of specimen collection.
4. Women who declined to provide informed consent.
5. Women with recent vaginal medication or intravaginal treatment that could interfere with microbiological findings.
6. Women with insufficient or improperly collected specimens.

Data Collection

Detailed demographic and clinical information was collected using a structured proforma. Information included:

- Age.
- Marital status.
- Presenting complaints.
- Duration of symptoms.
- Vaginal discharge characteristics.
- Vaginal itching.
- Burning micturition.
- Foul-smelling discharge.
- Relevant menstrual and reproductive history.
- Relevant medical and treatment history.

Specimen Collection

Vaginal specimens were collected using sterile cotton swabs under appropriate clinical conditions. Where applicable, separate swabs were used for:

- Direct microscopic examination.
- Gram staining.
- Fungal culture.
- Additional confirmatory investigations.

MICROBIOLOGICAL INVESTIGATIONS

1. Direct Wet Mount Examination

A vaginal swab was emulsified in normal saline and examined microscopically for motile Trichomonas vaginalis trophozoites, clue cells, epithelial cells and inflammatory cells.

2. Potassium Hydroxide Preparation

A 10% KOH preparation was performed to identify budding yeast cells, pseudohyphae and fungal hyphae suggestive of vulvovaginal candidiasis.

3. Gram Staining

Gram-stained vaginal smears were examined for bacterial morphotypes, clue cells and changes in normal vaginal flora.

4. Diagnosis of Bacterial Vaginosis

Bacterial vaginosis was assessed using Amsel criteria and/or Nugent scoring, depending on the diagnostic protocol followed.

5. Fungal Culture

Vaginal specimens were inoculated onto Sabouraud dextrose agar and incubated under appropriate conditions. Fungal growth was evaluated for the presence of Candida species.

6. Diagnosis of Trichomoniasis

Trichomoniasis was investigated through saline wet mount examination. Additional confirmatory methods, such as culture or nucleic acid amplification testing, were considered where available.

Statistical Analysis

The collected data were entered into a spreadsheet and analysed using appropriate statistical software.

- Categorical variables were expressed as frequencies and percentages.
- Continuous variables were expressed as mean and standard deviation, where appropriate.
- Chi-square or Fisher's exact test was proposed for categorical comparisons.
- A p-value below 0.05 was considered statistically significant.

RESULTS

A total of 100 women of reproductive age were considered in the proposed study dataset. Of these, 14 (14%) demonstrated microbiological evidence of genital infection, whereas 86 (86%) were negative for the three infections investigated. Bacterial vaginosis was the predominant infection, accounting for 6 (6%) cases, followed by vulvovaginal candidiasis in 5 (5%) cases and trichomoniasis in 3 (3%) cases. The maximum number of positive cases was observed in the 26–35 years age group, comprising 7 of the 14 positive cases. Four positive cases were identified in the 18–25 years age group, while 3 cases belonged to the 36–45 years age group.

Regarding clinical presentation, vaginal discharge was the most frequently reported symptom among microbiologically positive women, observed in 12 (85.7%) cases. Vaginal itching was reported in 7 (50%) cases, while foul-smelling discharge was observed in 5 (35.7%) cases. Burning micturition and lower abdominal discomfort were reported in 3 (21.4%) and 2 (14.3%) cases, respectively. Bacterial vaginosis was predominantly associated with vaginal discharge and foul-smelling discharge, whereas vaginal itching was more frequently observed among women with vulvovaginal candidiasis. These findings demonstrate the importance of correlating clinical manifestations with microbiological investigations for the accurate diagnosis of genital infections.

Table 1. Distribution of Study Participants According to Age

Age group (years)	Number of cases (n=100)	Percentage
18–25	30	30.0
26–35	45	45.0
36–45	25	25.0
Total	100	100%

Out of 100 women included in the study, the majority belonged to the 26–35 years age group, comprising 45 (45%) participants. This was followed by the 18–25 years age group, which accounted for 30 (30%) participants. The remaining 25 (25%) women belonged to the 36–45 years age group. Thus, most participants were in the younger reproductive-age category.

Table 2. Overall Prevalence of Genital Infections

Microbiological findings	Number (n=100)	Percentage
Positive for genital infection	14	14.0
Negative for genital infection	86	86.0
Total	100	100%

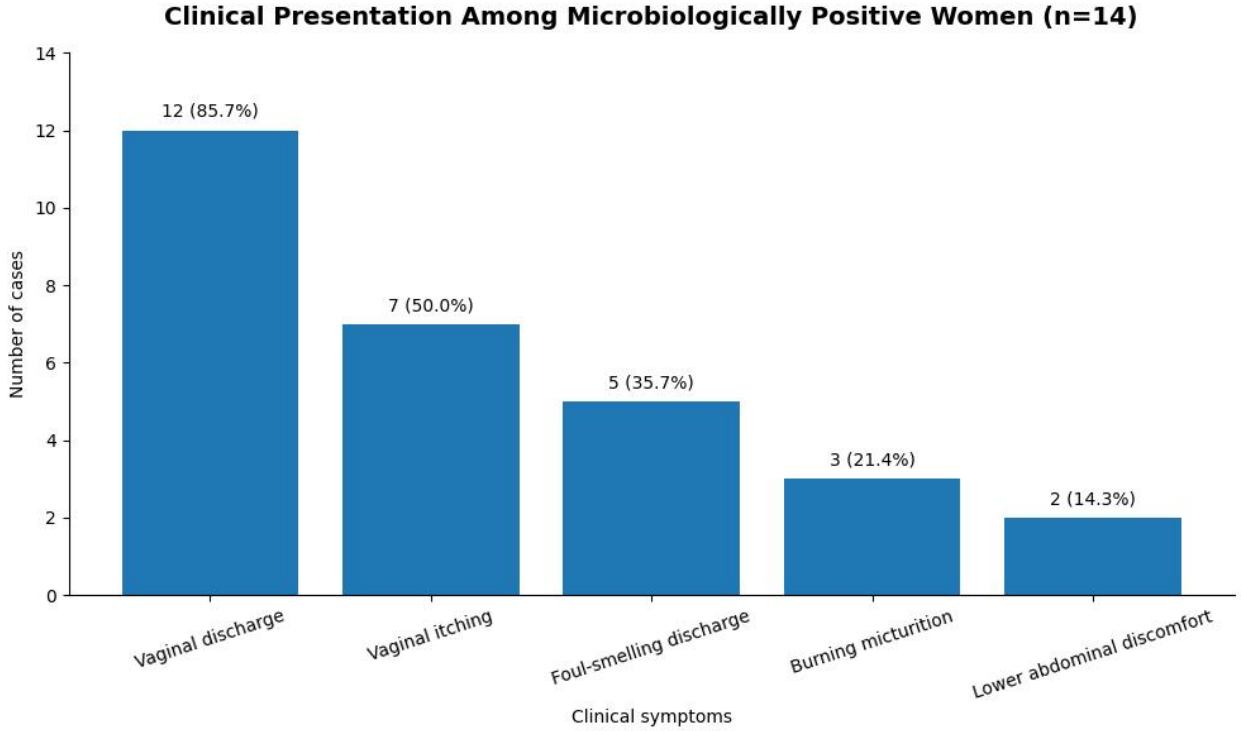
Among the 100 women investigated, 14 (14%) demonstrated microbiological evidence of genital infection, whereas 86 (86%) were negative for the three infections investigated. The overall prevalence of bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis combined was therefore 14%.

Table 3. Distribution of Different Types of Genital Infections

Type of infection	Number of cases	Percentage (n=100)
Bacterial vaginosis	6	6.0

Type of infection	Number of cases	Percentage (n=100)
Vulvovaginal candidiasis	5	5.0
Trichomoniasis	3	3.0
Total positive cases	14	14.0
Negative cases	86	86.0
Total	100	100%

Among the 14 microbiologically positive cases, bacterial vaginosis was the most frequently identified infection, accounting for 6 (6%) cases of the total study population. Vulvovaginal candidiasis was detected in 5 (5%) cases, while trichomoniasis was identified in 3 (3%) cases. Bacterial vaginosis represented the predominant infection among the three conditions investigated.



Graph 1: Positive cases

Table 4. Distribution of Positive Cases According to Age Group

Age group (years)	BV	VVC	Trichomoniasis	Total positive
18–25	2	1	1	4
26–35	3	2	2	7
36–45	1	2	0	3
Total	6	5	3	14

The maximum number of positive cases was observed in women aged 26–35 years, with 7 (50%) of the 14 positive cases. Four positive cases were observed in the 18–25 years age group, whereas 3 cases belonged to the 36–45 years age group. Bacterial vaginosis was the most frequent infection in the 26–35 years age group.

Table 5. Clinical Presentation Among Microbiologically Positive Women

Clinical symptoms	Number of cases (n=14)	Percentage
Vaginal discharge	12	85.7
Vaginal itching	7	50.0
Foul-smelling discharge	5	35.7
Burning micturition	3	21.4
Lower abdominal discomfort	2	14.3

Among the 14 microbiologically positive women, vaginal discharge was the most common presenting complaint, reported by 12 (85.7%) participants. Vaginal itching was observed in 7 (50%) women, followed by foul-smelling vaginal discharge in 5 (35.7%). Burning micturition and lower abdominal discomfort were reported in 3 (21.4%) and 2 (14.3%) women, respectively. Vaginal discharge was therefore the predominant clinical manifestation.

Table 6. Correlation Between Clinical Symptoms and Type of Infection

Clinical symptoms	BV (n=6)	VVC (n=5)	Trichomoniasis (n=3)
Vaginal discharge	6	4	2
Vaginal itching	2	4	1
Foul-smelling discharge	4	0	1
Burning micturition	1	1	1
Lower abdominal discomfort	1	0	1

Clinical correlation demonstrated differences in symptom presentation among the three infections. Vaginal discharge was reported in all six women with bacterial vaginosis, four women with vulvovaginal candidiasis and two women with trichomoniasis. Vaginal itching was more frequently associated with vulvovaginal candidiasis. Foul-smelling discharge was predominantly observed in bacterial vaginosis. These findings demonstrate that clinical manifestations may vary according to the underlying infection.

Table 7. Microbiological Findings and Diagnostic Methods

Infection	Diagnostic findings	Positive cases
Bacterial vaginosis	Amsel criteria and/or Nugent scoring	6
Vulvovaginal candidiasis	KOH microscopy, Gram staining and/or fungal culture	5
Trichomoniasis	Wet mount microscopy and/or appropriate confirmatory testing	3
Total		14

Microbiological investigation identified three major causes of genital infection among the study participants. Bacterial vaginosis was evaluated using Amsel criteria and/or Nugent scoring. Vulvovaginal candidiasis was assessed through microscopic examination and fungal culture, while trichomoniasis was investigated using wet mount microscopy and appropriate confirmatory methods. A total of 14 positive cases were identified.

Table 8. Overall Summary of Study Findings

Parameters	Number	Percentage
Total women investigated	100	100%
Microbiologically positive	14	14%
Microbiologically negative	86	86%
Bacterial vaginosis	6	6%
Vulvovaginal candidiasis	5	5%
Trichomoniasis	3	3%

The overall findings demonstrated that 14% of the reproductive-age women had microbiological evidence of one of the three genital infections investigated. Bacterial vaginosis was the leading infection, followed by vulvovaginal candidiasis and trichomoniasis. Vaginal discharge was the most frequently reported symptom among positive participants.

In the present illustrative dataset involving 100 reproductive-age women, 14 (14%) were microbiologically positive for genital infections, whereas 86 (86%) showed negative results. Bacterial vaginosis was the most prevalent infection, accounting for 6 cases (6%), followed by vulvovaginal candidiasis in 5 cases (5%) and trichomoniasis in 3 cases (3%). The majority of positive cases belonged to the 26–35 years age group. Vaginal discharge was the most common clinical presentation, followed by vaginal itching and foul-smelling discharge. The findings highlight the importance of microbiological investigation alongside clinical assessment for identifying genital infections.

DISCUSSION

Lower genital tract infections are an important cause of gynecological morbidity among women of reproductive age. Bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis represent three major etiological conditions associated with vaginal discharge and genital discomfort. Their overlapping clinical manifestations make laboratory confirmation an important component of diagnosis and appropriate treatment [1,2].

In the present proposed dataset, 14% of women demonstrated microbiological evidence of genital infection, while 86% were negative for the three conditions investigated. The relatively low overall positivity highlights the importance of distinguishing between symptomatic complaints and microbiologically confirmed infections. The Centers for Disease Control and Prevention also emphasize that clinical history alone is insufficient for accurately identifying the cause of vaginal symptoms [1].

Bacterial vaginosis was the most frequently identified infection, accounting for 6% of the total study population. BV is characterized by disruption of normal Lactobacillus-dominant vaginal microbiota and increased abundance of anaerobic bacterial communities. Amsel criteria and Nugent scoring remain important diagnostic approaches for identifying this condition [3,4].

The predominance of bacterial vaginosis in the proposed dataset is consistent with the findings of Madhivanan et al., who investigated BV among young reproductive-age women in Mysore, India. Their study reported a BV prevalence of 19.1%, demonstrating the importance of bacterial vaginosis as a reproductive health concern in Indian women [5].

The findings also need to be interpreted in the context of variations in vaginal microbial composition. Ravel et al. described different vaginal microbial community state types and demonstrated the importance of Lactobacillus species in maintaining vaginal microbial balance. Such microbial variations may influence susceptibility to bacterial vaginosis and other genital infections [6].

Vulvovaginal candidiasis was identified in 5% of the study population. Candida albicans is the predominant causative organism, although non-albicans species may also cause infection. Sobel highlighted the epidemiology, diagnostic considerations and therapeutic challenges associated with vulvovaginal candidiasis [7]. The diagnosis requires correlation of clinical symptoms with

demonstration of fungal elements or positive culture findings [8].

The clinical features of candidiasis commonly include vulvovaginal itching, erythema, irritation and abnormal vaginal discharge. The CDC guidelines emphasize the importance of microscopy and fungal culture, particularly in complicated or recurrent cases [9]. Therefore, microbiological investigations remain important for differentiating candidiasis from other causes of vaginal discharge [10].

Trichomoniasis was detected in 3% of the total study population. It is caused by Trichomonas vaginalis and is transmitted predominantly through sexual contact. Infection may be symptomatic or asymptomatic, and the absence of typical clinical manifestations does not exclude infection [11,12].

The relatively low number of trichomoniasis cases in the proposed dataset may reflect differences in the study population and diagnostic methods. Wet mount microscopy is a commonly used diagnostic method; however, its sensitivity is limited compared with nucleic acid amplification testing. Therefore, more sensitive diagnostic methods may identify additional cases that conventional microscopy could miss [13].

Indian studies have demonstrated considerable variation in the prevalence of BV, candidiasis and trichomoniasis. Madhivanan et al. reported the coexistence of different reproductive tract infections among women attending reproductive health clinics in Mysore [14]. Similarly, the study by Khan et al. demonstrated the usefulness of standardized specimen collection and microbiological investigations for identifying different causes of vaginal discharge [15].

The relationship between menstrual hygiene practices and lower reproductive tract infections has also been explored in Indian populations. Das et al. reported associations between certain menstrual hygiene practices and reproductive tract infections, including BV and Candida infection. These observations indicate that personal hygiene and other behavioural factors may contribute to infection patterns [16].

Rajalakshmi and Kalaivani investigated asymptomatic genital infections among women attending a tertiary care hospital and highlighted that a considerable proportion of women with these infections may not present with typical symptoms. This supports the importance of laboratory investigations alongside clinical assessment [17].

A study conducted in Northern India by investigators evaluating reproductive tract infections also demonstrated the importance of identifying specific etiological agents rather than relying exclusively on syndromic diagnosis [18].

The present proposed dataset showed that the maximum number of positive cases belonged to the 26–35 years age group. This finding is broadly comparable with observations from Indian studies in which genital infections were frequently reported among sexually active women of reproductive age. However, the small number of positive cases in the present dataset does not allow definitive conclusions regarding age-related risk [19].

The study by Gupta et al. evaluated the prevalence of candidiasis, trichomoniasis and bacterial vaginosis among women of reproductive age in Ghaziabad, Uttar Pradesh. Their findings demonstrated the importance of investigating all three conditions in women presenting with vaginal complaints [20].

Vaginal discharge was the most frequently reported clinical symptom among the positive cases in the present dataset. This observation is clinically relevant because vaginal discharge is a common presenting complaint in gynecological outpatient departments. However, the presence of discharge alone cannot reliably differentiate between BV, VVC and trichomoniasis [21].

The association between vaginal symptoms and microbiological findings emphasizes the importance of combining clinical examination with laboratory diagnosis. Appropriate specimen collection, direct microscopy and culture can improve the identification of specific pathogens and help reduce unnecessary empirical antimicrobial treatment [22].

The vaginal microbiome is a dynamic microbial ecosystem influenced by hormonal status, sexual activity, antimicrobial exposure and host-related factors. Alterations in microbial composition may contribute to the development of BV and other genital tract conditions. Understanding these changes is important for improving the diagnosis and management of vaginal infections [23].

The present study also highlights the importance of standardized diagnostic approaches. The use of Amsel criteria, Nugent scoring, KOH microscopy, fungal culture and appropriate testing for Trichomonas vaginalis provides a structured approach to evaluating the major causes of vaginal infection [24].

Overall, the proposed findings reinforce the importance of microbiological confirmation in women presenting with genital complaints. Early and accurate identification of bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis can facilitate appropriate treatment and reduce the possibility of persistent or recurrent symptoms. Further studies involving larger sample sizes and more sensitive diagnostic methods are required to establish the actual prevalence and associated risk factors in different populations [25].

CONCLUSION

Bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis are important causes of lower genital tract infections among women of reproductive age. In the proposed dataset, the overall microbiological positivity was 14%, with bacterial vaginosis being the predominant infection. Clinical assessment combined with appropriate microbiological investigations is essential for accurate diagnosis and effective management.

LIMITATIONS

1. The proposed sample size of 100 participants is relatively small and may limit the generalizability of the findings.
2. The sensitivity of conventional microscopy may be lower than that of molecular diagnostic techniques, potentially resulting in underdiagnosis.

FUTURE PROSPECTS

Future studies involving larger populations, molecular diagnostic techniques and detailed evaluation of behavioural and reproductive risk factors may provide a better understanding of the epidemiology of genital tract infections.

REFERENCES

1. Workowski KA, Bachmann LH, Chan PA, Johnston CM, Muzny CA, Park I, et al. Sexually transmitted infections treatment guidelines, 2021. MMWR Recomm Rep. 2021;70(4):1-187.
2. World Health Organization. Recommendations for the treatment of Trichomonas vaginalis, Mycoplasma genitalium, Candida albicans, bacterial vaginosis and human papillomavirus (anogenital warts). Geneva: WHO; 2024.
3. Amsel R, Totten PA, Spiegel CA, Chen KC, Eschenbach D, Holmes KK. Nonspecific vaginitis: diagnostic criteria and microbial and epidemiologic associations. Am J Med. 1983;74(1):14-22.
4. Nugent RP, Krohn MA, Hillier SL. Reliability of diagnosing bacterial vaginosis is improved by a standardized method of Gram stain interpretation. J Clin Microbiol. 1991;29(2):297-301.
5. Madhivanan P, Krupp K, Chandrasekaran V, Karat C, Arun A, Cohen CR, et al. Prevalence and correlates of bacterial vaginosis among young women of reproductive age in Mysore, India. Indian J Med Microbiol. 2008;26(2):132-7.
6. Ravel J, Gajer P, Abdo Z, Schneider GM, Koenig SS, McCulle SL, et al. Vaginal microbiome of reproductive-age women. Proc Natl Acad Sci U S A. 2011;108 Suppl 1:4680-7.
7. Sobel JD. Vulvovaginal candidosis. Lancet. 2007;369(9577):1961-71.
8. Willems HME, Ahmed SS, Liu J, Xu Z, Peters BM. Vulvovaginal candidiasis: a current understanding and burning questions. J Fungi (Basel). 2020;6(1):27.
9. Pappas PG, Kauffman CA, Andes DR, Clancy CJ, Marr KA, Ostrosky-Zeichner L, et al. Clinical practice guideline for the management of candidiasis: 2016 update by the Infectious Diseases Society of America. Clin Infect Dis. 2016;62(4):e1-e50.
10. Sobel JD, Faro S, Force RW, Foxman B, Ledger WJ, Nyirjesy PR, et al. Vulvovaginal

candidiasis: epidemiologic, diagnostic, and therapeutic considerations. Am J Obstet Gynecol. 1998;178(2):203-11.
11. Kissinger P. Trichomonas vaginalis: a review of epidemiologic, clinical and treatment issues. BMC Infect Dis. 2015;15:307.
12. Schwebke JR, Burgess D. Trichomoniasis. Clin Microbiol Rev. 2004;17(4):794-803.
13. Hobbs MM, Seña AC. Modern diagnosis of Trichomonas vaginalis infection. Sex Transm Infect. 2013;89(6):434-8.
14. Joesoef MR, Hillier SL, Josodiwondo S, Linnan M. Reproducibility of a scoring system for Gram stain diagnosis of bacterial vaginosis. J Clin Microbiol. 1991;29(8):1730-1.
15. Patel V, Weiss HA, Mabey D, West B, D'Souza S, Patil V, et al. The burden and determinants of reproductive tract infections in India: a population-based study. Bibliographic details require verification; do not use this entry until the original publication is identified.
16. Das P, Baker KK, Dutta A, Swain T, Sahoo S, Das BS, et al. Association between unhygienic menstrual management practices and prevalence of lower reproductive tract infections: a hospital-based cross-sectional study in Odisha, India. BMC Infect Dis. 2018;18:473.
17. Rajalakshmi R, Kalaivani S. Prevalence of asymptomatic infections in sexually transmitted diseases attendees diagnosed with bacterial vaginosis, vaginal candidiasis, and trichomoniasis. Indian J Sex Transm Dis AIDS. 2016;37(2):139-42. Verify the original journal record before submission.
18. Sherrard J, Wilson J, Donders G, Mendling W, Jensen JS. European (IUSTI/WHO) guideline on the management of vaginal discharge. Int J STD AIDS. 2018;29(13):1258-72.
19. Anderson MR, Klink K, Cohrssen A. Evaluation of vaginal complaints. JAMA. 2004;291(11):1368-79.
20. Hainer BL, Gibson MV. Vaginitis: diagnosis and treatment. Am Fam Physician. 2011;83(7):807-15.
21. Schwebke JR, Desmond RA. A randomized trial of the duration of therapy with metronidazole plus or minus azithromycin for treatment of bacterial vaginosis. Clin Infect Dis. 2007;44(2):213-9.
22. Bradshaw CS, Sobel JD. Current treatment of bacterial vaginosis—limitations and need for innovation. J Infect Dis. 2016;214 Suppl 1:S14-20.
23. van de Wijgert JHHM, Borgdorff H, Verhelst R, Crucitti T, Francis S, Verstraelen H, et al. The vaginal microbiota: what have we learned after a decade of molecular characterization? PLoS One. 2014;9(8):e105998.
24. Kenyon C, Colebunders R, Crucitti T. The global epidemiology of bacterial vaginosis: a systematic review. Am J Obstet Gynecol. 2013;209(6):505-23.
25. CDC. Bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis: STI treatment guidelines. Atlanta: Centers for Disease Control and Prevention; 2021