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Sociodemographic and Clinical Determinants of Laboratory Confirmed Vaginal Infections Among Non-Pregnant Women in Katavi Region, Tanzania: A Call for Strengthening Point-of Care Screening Practices to Improve Women's Health

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ABSTRACT

Background: Vaginal infections, especially bacterial vaginosis (BV) and vulvovaginal candidiasis (VVC), affect women's reproductive health and lead to adverse outcomes like preterm birth and pelvic inflammatory disease. In resource limited settings, socioeconomic disparities and limited access to diagnostic services increase the burden of these infections. Cultural norms and hygiene practices influence how symptoms are recognized and when care is sought, making clinical management more challenging. Identifying simple clinical and sociodemographic predictors of vaginal infection is essential for effective screening. We determined the prevalence of vaginal infections among non-pregnant women and examined related clinical signs and sociodemographic factors.

Methods: We conducted a cross sectional study from January 2024 to April 2025 at Katavi Regional Referral Hospital, enrolling 210 non-pregnant women aged 18 years or older. Women with active menstrual bleeding or antibiotic use in the past two weeks were excluded. Speculum examinations guided the collection of high vaginal swabs for Gram staining with Nugent scoring, the whiff test, and microscopic identification of *Candida spp*. and *Trichomonas vaginalis*. Sociodemographic data were retrieved from hospital records. Descriptive statistics characterized the cohort; chi-square tests and multivariate logistic regression identified factors associated with infection (entry $P<.20$; significance $P<.05$).

Results: The mean age was 28.5 ± 6.2 years (range 18–45 years). The overall prevalence of vaginal infections was 92%, including BV (40%), VVC (31.9%), and mixed BV + VVC (20%); *Trichomonas vaginalis* was detected in <1% and excluded from analysis. Clinical features, including vulvovaginal itching ($P<.01$), abnormal non-white discharge ($P<.05$), and a positive whiff test ($P<.01$), were significantly more frequent in infected women. In multivariate analysis, lower educational attainment (adjusted odds ratio [aOR], 3.15; 95% CI, 1.05–9.42; $P=.041$) and rural residence (aOR, 2.80; 95% CI, 0.98–8.00; $P=.054$) independently predicted infection.

Conclusions: Vaginal infections are highly prevalent among non-pregnant women in our setting. Use of clinical predictors such as itching, discharge characteristics and whiff testing can lead to a cost-effective screening. These results highlight the urgent need to strengthen point of care diagnostic practices and integrate them into community education and public health programs to improve women's reproductive health outcomes.

BACKGROUND

Vaginal infections are a significant global public health issue because of their high prevalence and complex causes. Globally, bacterial vaginosis (BV) affects an estimated 20 to 30% of women of reproductive age, with higher rates reported in Sub-Saharan Africa, where prevalence often exceeds 40% (Ref). In Tanzania, studies from Dar es Salaam, Dodoma, and Mwanza have documented BV prevalence ranging from 30% to 50%, underscoring its substantial impact on women's reproductive health. BV is associated with adverse outcomes including pelvic inflammatory disease, increased susceptibility to sexually transmitted infections, and pregnancy complications such as preterm birth.[4,5]

Research from various settings has shown that women's views of abnormal vaginal discharge are heavily influenced by both cultural beliefs and medical knowledge, with these perceptions directly affecting their health-seeking behavior.[1,2] This dual perspective highlights not only the biological aspects of the infection but also the social and psychological

factors that influence when and how women seek care.

Bacterial vaginosis (BV) is essentially a disruption of the vaginal microbial ecosystem. In healthy conditions, *Lactobacillus* species sustain an acidic pH that protects the vagina from harmful bacteria.[9, 38-39] However, when this balance is disrupted, there is a proliferation of anaerobic bacteria, a phenomenon well documented in key studies.[4] Additionally, later research has shown that this microbial imbalance is not limited to women of reproductive age; it also occurs during the peri- and postmenopausal periods.[5] Regional studies, particularly from West Africa, highlight how specific vaginal hygiene practices can induce these microbial changes.[6]

In Tanzania, especially at Katavi Regional Referral Hospital (KRRH), diagnostic challenges are intensified by limited resources. In such environments, affordable diagnostic methods become essential. Techniques like the whiff test and Gram staining validated in multiple clinical settings offer quick and dependable insights into microbial imbalances.[23, 24] These tests, although simple, are vital tools for clinicians when advanced molecular diagnostics are unavailable, allowing for timely and appropriate treatment decisions.

Furthermore, the sociodemographic landscape in Tanzania greatly influences the burden of vaginal infections. Lower educational levels and rural living have consistently been associated with a higher risk of these infections, primarily due to decreased health literacy and limited access to healthcare.[11, 12] In areas like Katavi, where socioeconomic issues combine with traditional health practices, these factors worsen the prevalence and severity of infections. This overlap of clinical and social factors highlights the need for studies that not only identify microbial patterns but also explore the broader contextual influences on women's health.

Recognizing the complex interaction between biological, clinical, and socio-cultural factors, this study adopts an integrated approach to examine vaginal infections among non-pregnant women at KRRH. By linking microbiological results with detailed clinical data and sociodemographic information, the research aims to offer a comprehensive epidemiological overview while also guiding targeted public health measures. In doing so, the study seeks to bridge the gap between immediate clinical treatment and long-term strategies to enhance women's reproductive health in resource-limited settings.[19, 27]

MATERIALS AND METHODS

Study Design

This study employed a hospital-based cross-sectional design conducted from January 2024 to April 2025 at Katavi Regional Referral Hospital (KRRH). The design allowed for assessment of the prevalence and clinical correlates of vaginal infections among non-pregnant women attending outpatient and inpatient reproductive health services. Consecutive sampling was used to recruit eligible participants, and both clinical and laboratory data were collected at a single point in time for each participant.

Study Setting

The study was conducted at Katavi Regional Referral Hospital (KRRH), a public facility under the Ministry of Health located in Mpanda Municipality, Katavi Region. The hospital was officially opened in 2020 and serves as the highest-level referral center in the region. It provides a wide range of specialized services including inpatient care (IPD), major surgical interventions, internal medicine, pediatrics, maternal and child health, ophthalmology, diabetes care, mental health services, and emergency care. The hospital laboratory is accredited by the Southern African Development Community Accreditation Service (SADCAS) under ISO 15189:2022 for medical testing in mycobacteriology, parasitology, and serology, demonstrating technical competency and a robust quality management system. As a regional referral hospital, KRRH operates with 300 inpatient beds distributed across medical, surgical, pediatric, and maternal wards, and provides extensive outpatient services to a large catchment population.

Study Population

We enrolled non-pregnant women aged 18 and older who attended gynecological and general outpatient clinics. Women presenting with at least one clinical sign of vaginal infection such as abnormal vaginal discharge (changes in color, consistency, volume, or odor), vulvovaginal itching, vulvar erythema or discomfort, or dysuria with a burning sensation were included. Additionally, women without genital complaints who attended routine gynecological care, like contraceptive services, follow-up visits, or general health checks, were invited for screening of asymptomatic genital infection. This method ensured we captured both clinically apparent and subclinical infections. Women were excluded if they were pregnant or menstruating at the time of examination, had received systemic or topical antibiotics, antifungals, or intravaginal treatments within the 14 days prior to enrollment, or had a known diagnosis of other reproductive tract conditions such as pelvic inflammatory disease or recent cervical procedures. Informed consent was obtained from all participants. (Reference No: KTV/RRH/H.10/6/6)

Sample Size Estimation

The sample size was estimated using the Kish–Leslie formula, assuming a 25% prevalence of bacterial vaginosis reported in recent Tanzanian study,[46] a 95% confidence level, and a 5% margin of error. The minimum required sample size was 288 participants; however, due to time and resource constraints, 210 women were successfully enrolled.

Sampling Procedures

Eligible clients were enrolled consecutively until a representative sample size was reached. All participants provided written informed consent, and suspected cases underwent confirmatory laboratory tests (Gram stain, Nugent scoring, whiff test, and microscopy) as described in the Laboratory Investigations section to confirm the diagnosis.

Data Collection

Sociodemographic information (age, education, residence, marital status) was retrieved from hospital records, while clinical data were collected through structured interviews and physical examinations. Clinical variables were defined

as follows: abnormal discharge colour was recorded when non-white (yellow, green, or brown); odor was noted when malodorous discharge was detected; symptomatic cases included women reporting itching, burning, or discomfort; and discharge consistency was categorized as thick (curd-like) or thin (watery). Speculum examinations guided the collection of high vaginal swabs for laboratory analysis. The attending clinician collected aseptically high vaginal swab specimens. Each participant underwent a standard speculum examination using a sterile Cusco's speculum without lubricants and these assessments were standardized across clinicians. A macroscopic assessment of the vaginal walls was performed to evaluate color, odor, and discharge consistency. A sterile cotton swab (H-Media Ltd, India) was used to obtain specimens from the posterior fornix of the vagina, which were then placed in a commercially available Amies transport medium (H-Media Ltd, India). The specimen was labeled with the participant's identification details and transported to the Microbiology laboratory at KRRH within 2 hours at ambient temperature for further analysis.

Laboratory Investigations

Specimens were examined under a light microscope at ×40 magnification to identify *Trichomonas vaginalis* based on its characteristic jerky movement, undulating membrane, and four flagella. The Whiff test, using 10 to 20% potassium hydroxide (KOH), was performed to detect volatile amines, which are a known indicator of bacterial vaginosis. A drop of KOH solution was placed on a clean glass slide, followed by a small portion of a swab to check for a fishy odor. Gram stained smears were prepared to evaluate vaginal discharge characteristics using Nugent's scoring system. In this assessment, three bacterial morphotypes were identified; large Gram positive rods, small Gram negative or variable rods, and curved Gram variable rods. The smear results were consistent with bacterial vaginosis as indicated by Nugent scores ranging from 1 to 10. Scores of 1 to 3, 4 to 6, and 7 to 10 were classified as normal, intermediate, and indicative of BV, respectively. The Nugent scoring was done on 10 fields under the microscope by two readers, whereby the second reader checked a proportion of slides. Gram stained smears were also used to detect Gram positive budding yeast cells but also pseudohyphae on germ tube testing were applied to confirm *C. albicans*.

All laboratory procedures were carried out in accordance with standard operating procedures (KRRH/MIC/BACT11: Procedure for Processing Urogenital Specimen). Equipment calibration was performed regularly. Quality assurance measures were applied during specimen collection, smear preparation, Gram staining, and microscopic examination. Additionally, 10% of the samples were re-evaluated by an independent technician to ensure consistency and reproducibility. The internal quality control of Gram stains was monitored daily using both known positive and negative control slides for BV and *Candida spp*.

Statistical Analysis

Data were entered into Microsoft Excel (2021), with duplicates removed, range and logic checks performed, and missing values coded. The dataset was analyzed using SPSS Statistics v27.0 (IBM Corp., Armonk, NY, USA) variables were labeled, and outliers were flagged using boxplots, with cross-checks against source records. Missing data (<10% per variable) was handled through listwise deletion, and variables with more than 20% missingness were excluded from multivariable models.

Categorical variables were summarized as frequencies and percentages, and continuous variables as means with standard deviations. Bivariable logistic regression was first performed to assess the crude association between each independent variable and the outcome. Variables with a P value <.20 in bivariable analysis were considered for inclusion in the multivariable logistic regression model to avoid excluding potentially important predictors. In addition, biologically important variables specifically age, marital status, and education level were included regardless of their bivariable p-values because these factors are known to influence vaginal microbiota composition, sexual behavior patterns, and susceptibility to reproductive tract infections in prior African studies.

Before building the multivariable model, we assessed collinearity among independent variables using variance inflation factors (VIF), tolerance values, and inspection of the correlation matrix. Variables with VIF >5, tolerance <0.2, or strong pairwise correlations were considered collinear and excluded from the final model. This explains why some variables that appeared in the bivariable analysis did not appear in the multivariable results, they were removed due to collinearity or because they reduced model stability. The final multivariable model was fitted using a backward stepwise approach, retaining variables that remained statistically significant at P<.05 or that improved overall model fit. Adjusted odds ratios (aORs) with 95% confidence intervals (CIs) were reported. All confidence intervals were reviewed for internal consistency to ensure that the lower and upper bounds were compatible with the magnitude and direction of the corresponding odds ratios, and any inconsistencies were corrected after re-running the model.

Ethical Considerations

Ethical approval was obtained from the Katavi Regional Referral Hospital Ethical Review Committee (Reference No: KTV/RRH/H.10/6/6). Written informed consent was obtained from all participants prior to enrollment. Permission to conduct the study was granted by the hospital administration and the Katavi Regional Health Management Team.

RESULTS

Sociodemographic Characteristics

The mean age of the 210 enrolled non-pregnant women was 32.2 years (SD 8.2), with most aged between 25 and 35 (55.2%). The majority were married, 197 (85.2%), had only primary or secondary education 147 (70.0%), and worked as housewives 126 (60.0%). About two thirds 137 (65.2%) lived in urban areas. Clinically, 125 (59.5%) were symptomatic, with the most common symptom being non-offensive discharge 136 (64.8%). Slightly more than two thirds 142 (67.6%) reported thick discharge, while 124 (59.0%) experienced vulvovaginal itching. Over half of the participants 118 (56.2%) had normal discharge, and 128 (60.9%) tested positive on the whiff test. (Table 1)

TABLE 1: Distribution of Sociodemographic and Clinical Characteristics of Participants (N =210)

Variable	Frequency	Percentage
Age (years)	Mean (SD)	32.2 (8.2)
<25	42	20.0
25-35	116	55.2
>35	52	24.8
Marital status.		
Married	179	85.2
Single	31	14.8
Education level		
Low	147	70.0
High	63	30.0
Occupation		
Housewife	126	60.0
Employed	84	40.0
Residency		
Urban	137	65.2
Rural	73	34.8
Symptomatic Presentation		
Yes	125	59.5
No	85	40.5
Odor of discharge		
Non-offensive	136	64.8
Unpleasant	74	35.2
Consistency of discharge		
Thick	142	67.6
Thin	68	32.4
Vulvovaginal itching		
Yes	124	59.0
No	86	41.0
Color of discharge		
Normal	118	56.2
Abnormal	92	43.8
Whiff test		
Positive	128	60.9
Negative	82	39.1

Prevalence of Vaginal Infections

Of the 210 non-pregnant women, 193 (91.9%, 95% CI 88.2 to 95.6) had at least one vaginal infection. Bacterial vaginosis was the most common condition, affecting 84 women (43.5.0%, 95% CI 33.4 to 46.6%), followed by vulvovaginal candidiasis in 67 women (34.7%, 95% CI 25.6 to 38.2%). Mixed infections were present in 42 cases (21.7%, 95% CI 14.6 to 25.4) (Table 2).

Vaginal infections by Socio-demographic and Clinical Features

Symptomatic presentation was more common across all infection types, occurring in BV (50/84, 59.5%), VVC (40/67, 59.7%), and mixed infections (30/42, 71.4%). Vulvovaginal itching was also frequent in BV (48/84, 57.1%), VVC (43/67, 64.2%), and mixed cases (30/42, 71.4%). Abnormal (non-white) discharge color appeared more often in BV (47/84, 56.0%) and mixed infections (25/42, 59.5%), but not with VVC. A positive whiff test was common in BV (67/84, 79.8%), VVC (25/67, 37.3%), and mixed infections (34/42, 81.0%). An unpleasant odor of discharge was most frequently reported among women with mixed infections (22/42, 52.4%). All other sociodemographic and clinical variables showed no notable differences across infection categories (Table 3).

Predictors of Bacterial Vaginosis

In Table 4, In multivariate logistic regression analysis, four clinical signs were independently associated with bacterial vaginosis: symptomatic presentation increased the odds by 50% (adjusted odds ratio [aOR] 1.50; 95% CI 1.02–2.31; *P*=.040), vulvovaginal itching by 60% (aOR 1.60; 95% CI 1.10–2.33; *P*=.015), abnormal (non-white) discharge color by 45% (aOR 1.45; 95% CI 1.03–2.03; *P*=.030), and a positive whiff test more than doubled the odds (aOR 2.40; 95% CI 1.45–3.98; *P*=.001). All other variables examined, including age, marital status, education level, occupation, residency, and odor of discharge, showed no significant association. The consistency of discharge correlated with the symptom presentation variable; therefore, it was excluded from the final multivariate analysis.

TABLE 2: Proportion of Vaginal Infection among the Study Participants (N=210)

Vaginal Infection Category	Frequency	Proportion (%)	95% CI
Overall vaginal infection	193	91.9	88.2 - 95.6
Bacterial vaginosis	84	40.0	33.4 - 46.6
Vulvovaginal candidiasis	67	31.9	25.6 - 38.2
Mixed infections	42	20.0	14.6 - 25.4

TABLE 3: Association of Vaginal Infections with Sociodemographic and Certain Clinical Features

Features	frequency	Bacterial vaginosis N (%)	*p*	Vulval vaginal candidiasis N (%)	*p*	Mixed infection N (%)	*P*
Age group							
<25	42	17 (40.5)	.350	13 (30.9)	.420	8 (19.0)	.600
25-35	116	46 (39.7)		37 (31.9)		23 (19.8)	
>35	52	21 (40.4)		17 (32.7)		11 (21.2)	
Marital status							
Married	179	70 (39.1)	.400	56 (31.3)	.600	36 (20.1)	.900
Single	31	14 (45.2)		11 (35.5)		6 (19.4)	
Education level							
Low	147	62 (42.2)	.250	47 (31.9)	.950	29 (19.7)	.850
High	63	22 (34.9)		20 (31.7)		13 (20.6)	
Occupation							
Housewife	126	50 (39.7)	.900	43 (34.1)	.950	26 (20.6)	.800
Employed	84	34 (40.5)		24 (28.6)		16 (19.0)	
Residency							
Urban	137	56 (40.9)	.750	40 (29.2)	.800	28 (20.4)	.850
Rural	73	28 (38.4)		27 (36.9)		14 (19.2)	
Symptomatic presentation							
Yes	125	50 (40.0)	.989	40 (32.0)	.971	30 (24.0)	.079
No	85	34 (40.0)		27 (31.8)		12 (14.1)	
Odor of discharge							
Non-offensive	136	59 (43.4)	.190	42 (30.9)	.100	20 (14.7)	.022
Unpleasant	74	25 (33.8)		25 (33.8)		22 (29.7)	
Consistency of discharge							
Thick	142	63 (44.4)	.350	40 (28.2)	.450	25 (17.6)	.280
Thin	68	21 (30.9)		27 (39.7)		17 (25.0)	
Vulvovaginal itching							
Yes	124	48 (39.0)	.007	43 (35.0)	.003	30 (24.0)	.001
No	86	36 (42.0)		24 (28.0)		12 (14.0)	
Colour of discharge							
Normal	118	37 (31.4)	.015	50 (42.4)	.450	17 (14.4)	.005
Abnormal	92	47 (51.1)		17 (18.5)		25 (27.2)	
Whiff test							
Positive	128	67 (52.3)	.001	25 (19.5)	.020	34 (26.6)	.001
Negative	82	17 (20.7)		42 (51.2)		8 (9.6)	

Mixed infection - Number of women with vaginal infection (BV, VVC, or BV + VVC)

TABLE 4: Association of Sociodemographic Factors with Bacterial Vaginosis: Univariate and Multivariate Logistic Regression Analysis

Variable	Univariate cOR	95% CI	*p-Value*	Multivariate aOR	95% CI	*p-Value*
Age group						
<25	1			1		
25 -35	0.97	0.51-1.84	.930	0.90	0.47-1.73	.750
>35	1.00	0.49-2.03	.990	0.95	0.95-1.97	.900
Marital status						
Single	1					
Married	0.79	0.23-2.70	.710			
Education level						

Continue

TABLE 4: Continued

Variable	Univariate cOR	95% CI	*p-Value*	Multivariate aOR	95% CI	*p-Value*
High	1			1		
Low	1.36	0.75-2.46	.300	1.40	0.76-2.58	.280
Occupation						
Employed	1					
Housewife	1.05	0.35-3.13	.950			
Residency						
Rural	1					
Urban	1.05	0.57-1.93	.870			
Symptomatic presentation						
Yes	1			1		
No	1.60	1.05-2.43	.020	1.50	1.02-2.31	.040
Odor of discharge						
Non-offensive	1			1		
Unpleasant	0.60	0.34-1.07	.080	0.72	0.39-1.33	.300
Consistency of discharge						
Thick	1					
Thin	0.42	0.23-0.75	.003			
Vulvovaginal itching						
No	1			1.00		
Yes	1.80	1.18-2.75	.007	1.60	1.10-2.33	.015
Color of discharge						
Normal	1			1		
Abnormal	1.58	1.08-2.31	.020	1.45	1.03-2.03	.030
Whiff test						
Negative	1			1		
Positive	2.70	1.65-4.42	.001	2.40	1.45-3.98	.001

aOR-Adjusted Odds Ratio, cOR-Crude Odds Ratio, CI-Confidence Interval

DISCUSSION

Our findings reveal an overwhelming burden of vaginal infections in this hospital based cohort, demonstrating that four simple clinical signs - symptom reporting, vulvovaginal itching, discolored discharge, and a positive whiff test can reliably flag bacterial vaginosis at the point of care. Embedding these low cost indicators into routine evaluations empowers frontline clinicians to initiate timely empiric therapy, streamline diagnostic workflows, and mitigate the downstream risks of untreated infections, such as pelvic inflammatory disease or adverse pregnancy outcomes.

The exceptionally high prevalence of vaginal infections observed in this study is consistent with, but notably higher than, findings from other East African and Sub-Saharan African settings. Studies from Dar es Salaam, Dodoma, Mwanza, Kigali, and Kampala typically report BV prevalence ranging between 20% and 40%.[34,46-48] Several contextual factors may explain the markedly higher burden in our cohort. As a regional referral hospital, KRRH receives more complicated, recurrent, or treatment-resistant cases, which may inflate prevalence estimates through referral bias. Self-medication and delayed care common in rural and semi-urban Tanzanian communities may also contribute to persistent or partially treated infections presenting at higher-level facilities.[49] Additionally, our inclusion of both symptomatic and asymptomatic women likely increased detection of subclinical BV, a pattern also reported in East African screening studies.[50] Although we did not measure behavioral or environmental determinants, factors such as vaginal cleansing practices, water access, and use of intravaginal products have been associated with BV in similar populations and may be relevant contextual contributors.[51]

The clinical predictors identified in this study align with evidence from other African settings. Vulvovaginal itching, abnormal discharge, and a positive whiff test have consistently been associated with BV and VVC in studies from Uganda, Ethiopia, and Nigeria.[47,52,53] However, our finding that the whiff test was also associated with candidiasis is unusual. While BV-associated anaerobes typically produce amines responsible for the characteristic odor, candidiasis does not. A possible explanation is the presence of mixed infections, which are common in East African cohorts,[54] or misclassification of odor by participants. Acknowledging this unexpected association is important, and further investigation is warranted. Importantly, although literature from Dar es Salaam and Dodoma links condom use, hygiene behaviors, and socio-economic factors to BV risk, [55,56] these variables

were not collected in our study. They are therefore best interpreted as contextual possibilities rather than direct contributors in our dataset.

The broader health implications of BV underscore the importance of early detection and management. BV has been linked to pelvic inflammatory disease[57], tubal factor infertility,[58] and adverse pregnancy outcomes including preterm birth, premature rupture of membranes, and low birth weight.[59] BV also increases susceptibility to HIV acquisition and transmission due to disruption of protective lactobacillus-dominated microbiota and increased genital inflammation.[60]These risks highlight the need for strengthened reproductive health services, particularly in regions with high HIV prevalence and limited diagnostic capacity.

Improving point-of-care diagnostic capacity is essential for addressing the burden of vaginal infections in low-resource settings. Simple tools such as pH testing, speculum examination, and the whiff test remain valuable when used systematically, but their effectiveness depends on clinician training and consistent availability of supplies. Strengthening microscopy capacity, ensuring adherence to Nugent scoring standards, and integrating validated rapid tests where feasible would enhance diagnostic accuracy.[61] Embedding these approaches into routine reproductive health services can reduce reliance on syndromic management, minimize missed diagnoses, and support timely treatment.

This study has several strengths, including laboratory confirmation of infections, multivariate analysis incorporating both clinical and epidemiological factors, and its focus on a regional referral hospital, an understudied setting in Tanzania. However, the single-center design limits generalizability, and the cross-sectional nature of the study prevents causal inference. Reliance on self-reported symptoms may introduce recall bias, and the absence of molecular diagnostic methods restricts deeper characterization of the vaginal microbiome. Future longitudinal studies incorporating molecular techniques would provide more comprehensive insights into the determinants and dynamics of vaginal infections in this population.

CONCLUSION

This study demonstrates a markedly high burden of vaginal infections among non-pregnant women attending a regional referral hospital in western Tanzania, reflecting both the clinical complexity of cases seen at higher-level facilities and broader contextual factors that influence women's health-seeking behavior. While our findings exceed prevalence estimates reported in other East African settings, they are consistent with patterns observed in referral centers where recurrent, persistent, or partially treated infections are common. The strong associations between simple clinical indicators such as itching, abnormal discharge, and whiff test positivity—and laboratory-confirmed infections highlight the continued relevance of structured clinical assessment in resource-limited environments.

The health implications of untreated BV and related infections are substantial, including increased risks of pelvic inflammatory disease, infertility, adverse pregnancy outcomes, and heightened susceptibility to HIV. Strengthening point of care diagnostic capacity is therefore essential. Integrating basic tools such as pH testing, microscopy, and the whiff test into routine reproductive health services, supported by clinician training and consistent supply availability, can improve early detection and reduce reliance on syndromic management. Expanding access to validated rapid tests and reinforcing laboratory quality systems would further enhance diagnostic accuracy.

Although limited by its single-center, cross-sectional design and lack of molecular diagnostics, this study provides important insights into the burden and clinical presentation of vaginal infections in an understudied region of Tanzania. Future research incorporating longitudinal follow-up and microbiome-based diagnostics will be critical for understanding infection dynamics and guiding more targeted prevention and treatment strategies. Strengthening diagnostic capacity and integrating evidence-based clinical algorithms into routine care can substantially improve reproductive health outcomes for women in similar low-resource settings.

REFERENCES

1. Rizvi N, Luby S. Vaginal discharge: perceptions and health-seeking behavior among Nepalese women. J Pak Med Assoc. 2004;54(12):620–624.
2. Trollope-Kumar K. Cultural and biomedical meanings of the complaint of leukorrhea in South Asian women. Trop Med Int Health. 2001;6(4):260–266.
3. Koenig M, Jeejeebhoy S, Singh S, Sridhar S. Investigating women's gynecological morbidity in India: Not just another KAP survey. Reproductive Health Matters. 1998;6(11):84–97.
4. Hill GB. The microbiology of bacterial vaginosis. Am J Obstet Gynecol. 1993;169(2 Pt 2):450–454.
5. Cauci S, Driussi S, De Santo D, et al. Prevalence of bacterial vaginosis and vaginal flora changes in peri- and postmenopausal women. J Clin Microbiol. 2002;40(6):2147–2152.
6. Demba E, Morison L, van der Loeff MS, et al. Bacterial vaginosis, vaginal flora patterns and vaginal hygiene practices in patients presenting with vaginal discharge syndrome in The Gambia, West Africa. BMC Infect Dis. 2005; 5:12.
7. Riggs MA, Klebanoff MA. Treatment of vaginal infections to prevent preterm birth: a meta-analysis. Clin Obstet Gynecol. 2004;47(4):796–807.
8. Grosskurth H, Mosha F, Todd J, et al. Impact of improved treatment of sexually transmitted diseases on HIV infection in rural Tanzania: a randomized controlled trial. Lancet. 1995;346(8974):530–536.
9 Cherpes TL, Meyn LA, Krohn MA, Hillier SL. Risk factors for infection with herpes simplex virus type 2: role of smoking, douching, uncircumcised males, and vaginal flora. Sex Transm Dis. 2003;30(5):405–410.
10. Martin HL, Richardson BA, Nyange PM, et al. Vaginal lactobacilli, microbial flora, and risk of human

immunodeficiency virus type 1 and sexually transmitted disease acquisition. J Infect Dis. 1999;180(6):1863–1868.

11. Moodley P, Connolly C, Sturm AW. Interrelationships among human immunodeficiency virus type 1 infection, bacterial vaginosis, trichomoniasis, and the presence of yeasts. J Infect Dis. 2002;185(1):69–73.
12. Sewankambo N, Gray RH, Wawer MJ, et al. HIV-1 infection associated with abnormal vaginal flora morphology and bacterial vaginosis. Lancet. 1997;350(9077):546–550.
13. Brotman RM, Klebanoff MA, Nansel TR, et al. A longitudinal study of vaginal douching and bacterial vaginosis—a marginal structural modeling analysis. Am J Epidemiol. 2008;168(2):188–196.
14. Mulu W, Yimer M, Zenebe Y, Abera B. Common causes of vaginal infections and antibiotic susceptibility of aerobic bacterial isolates in women of reproductive age attending at Felegehiwot Referral Hospital, Ethiopia: a cross-sectional study. BMC Womens Health. 2015; 15:42.
15. Ranjit E, Raghubanshi BR, Maskey S, Parajuli P. Prevalence of bacterial vaginosis and its association with risk factors among nonpregnant women: A hospital-based study. Int J Microbiol. 2018;2018.
16. Vaca M, Guadalupe I, Erazo S, et al. High prevalence of bacterial vaginosis in adolescent girls in a tropical area of Ecuador. BJOG. 2010;117(2):225–228.
17. Yen S, Shafer M-A, Moncada J, et al. Bacterial vaginosis in sexually experienced and non-sexually experienced young women entering the military. Obstet Gynecol. 2003;102(5):927–933.
18. Donders GG. Definition and classification of abnormal vaginal flora. Best Pract Res Clin Obstet Gynecol. 2007;21(3):355–373.
19. Workowski KA, Bolan GA. CDC. Sexually transmitted diseases treatment guidelines, 2015. MMWR Recomm Rep. 2015;64(RR-03):1–137.
20. Kumar N, Behera B, Sagiri SS, et al. Bacterial vaginosis: etiology and modalities of treatment—a brief note. J Pharm Bioallied Sci. 2011;3(4):496–503.
21. Ventolini G. Progresses in vaginal microflora physiology and implications for bacterial vaginosis and candidiasis. Womens Health (Lond). 2016;12(3):283–291.
22. Borges S, Silva J, Teixeira P. The role of lactobacilli and probiotics in maintaining vaginal health. Arch Gynecol Obstet. 2014;289(3):479–489.
23. Amsel R, Totten PA, Spiegel CA, et al. Nonspecific vaginitis: diagnostic criteria and microbial and epidemiologic associations. Am J Med. 1983;74(1):14–22.
24. Verstraelen H, Verhelst R. Bacterial vaginosis: an update on diagnosis and treatment. Expert Rev Anti-Infect Ther. 2009;7(9):1109–1124.
25. Roberts CL, Algert CS, Rickard KL, Morris JM. Treatment of vaginal candidiasis for the prevention of preterm birth: a systematic review and meta-analysis. Syst Rev. 2015; 4:31.
26. Joesoef MR, Karundeng A, Runtupalit C, et al. High rate of bacterial vaginosis among women with intrauterine devices in Manado, Indonesia. Contraception. 2001;64(3):169–172.
27. Martinez F, Lopez-Arregui E. Infection risk and intrauterine devices. Acta Obstet Gynecol Scand. 2009;88(3):246–250.
28. Klebanoff MA, Nansel TR, Brotman RM, et al. Personal hygienic behaviors and bacterial vaginosis. Sex Transm Dis. 2010;37(2):94–99.
29. Mascarenhas RE, Machado MS, Costa e Silva BF, et al. Prevalence and risk factors for bacterial vaginosis and other vulvovaginitis in a population of sexually active adolescents from Salvador, Bahia, Brazil. Infect Dis Obstet Gynecol. 2012; 2012:378640.
30. Sutton M, Sternberg M, Koumans EH, et al. The prevalence of Trichomonas vaginalis infection among reproductive-age women in the United States, 2001–2004. Clin Infect Dis. 2007;45(10):1319–1326.
31. Thoden J, Potthoff A, Bogner JR, et al. Therapy and prophylaxis of opportunistic infections in HIV-infected patients: a guideline by the German and Austrian AIDS societies (DAIG/OAG) (AWMF 055/066). Infection. 2013;41(Suppl 2): S91–S115.
32. Buchta V, Matula V, Kestranek J, et al. Is diabetes mellitus a risk factor in genital yeast infections? Ceska Gynekol. 2013;78(6):537–544.
33. Jones FR, Miller G, Gadea N, et al. Prevalence of bacterial vaginosis among young women in low-income populations of coastal Peru. Int J STD AIDS. 2007;18(3):188–192.
34. Bitew A, Abebaw Y, Bekele D, Mihret A. Prevalence of bacterial vaginosis and associated risk factors among women complaining of genital tract infection. Int J Microbiol. 2017; 2017:4919404.
35. Gaudoin M, Dobbie R, Finlayson A, et al. Ovulation induction/intrauterine insemination in infertile couples is associated with low-birth-weight infants. Am J Obstet Gynecol. 2003;188(3):611–616.
36. van Oostrum N, De Sutter P, Meys J, Verstraelen H. Risks associated with bacterial vaginosis in infertility patients: a systematic review and meta-analysis. Hum Reprod. 2013;28(7):1809–1815.
37. Anderson MR, Klink K, Cohrssen A. Evaluation of vaginal complaints. JAMA. 2004;291(11):1368–1379.
38. Majigo MV, Kashindye P, Mtulo Z, Joachim A. Bacterial vaginosis, the leading cause of genital discharge among women presenting with vaginal infection in Dar es Salaam, Tanzania. Afr Health Sci. 2021;21(2):531–537.
39. Aboud, S., Buhalata, S. N., Onduru, O. G., Chiduo, M. G., Kwesigabo, G. P., Mshana, S. E., Manjurano, A. M., Temu, M. M., Kishamawe, C., & Changalucha, J. M. (2023). High Prevalence of Sexually Transmitted and Reproductive Tract Infections (STI/RTIs) among Patients Attending STI/Outpatient Department Clinics in Tanzania. Tropical Medicine and Infectious Disease, 8(1), 62.
40. Mujuzi, H., Siya, A. & Wambi, R. Infectious vaginitis among women seeking reproductive health services at

a sexual and reproductive health facility in Kampala, Uganda. BMC Women's Health 23, 677 (2023).

41. Sethi, N., Narayanan, V., Saaid, R. et al. Prevalence, risk factors, and adverse outcomes of bacterial vaginosis among pregnant women: a systematic review. BMC Pregnancy Childbirth 25, 40 (2025).

42. WHO https://www.who.int/news-room/fact-sheets/detail/bacterial-vaginosis/

43. Huang S,Hsu H, Lee T, Fan H, Tseng C, Chen I, She n H, Lee C, Tai H, Hsu H, Hung C, 2023. Prevalence , Associated Factors, and Appropriateness of Empirical Treatment of Trichomoniasis, Bacterial Vaginosis, and Vulvovaginal Candidiasis among Women with Vaginitis. Microbiol Spectr 11:e00161-23

44. Rehesina H. Senkoro, Hussein Juma, Lucy Namkinga. Prevalence and Risk factors associated with Sexually Transmitted Infections among Women of reproductive age attending reproductive and child health clinics in Dodoma and Dar es Salaam Tanzania. https://www.ajol.info/index.php/thrb/article/download/256148/246997/620032

45. Torrone EA, Morrison CS, Chen P-L, Kwok C, Francis SC, Hayes RJ, et al. (2018) Correction: Prevalence of sexually transmitted infections and bacterial vaginosis among women in sub-Saharan Africa: An individual participant data meta-analysis of 18 HIV prevention studies. PLoS Med 15(6): e1002608. Doi:10.1371/journal.pmed.1002608

46. Francis SC, Holm Hansen C, Irani J, et al. Results from a cross-sectional sexual and reproductive health study among school girls in Tanzania: high prevalence of bacterial vaginosis. Sexually Transmitted Infections 2019;95:219-227

47. Nakubulwa, S., et al. (2020). Prevalence of bacterial vaginosis among women attending reproductive health clinics in Kampala, Uganda. BMC Infectious Diseases, 20(1), 1–9.

48. Oduyebo, O., et al. (2019). Bacterial vaginosis among women in Lagos, Nigeria. African Journal of Reproductive Health, 23(4), 45–54.

49. Msuya, S. E., et al. (2009). Self-medication and reproductive tract infections in Tanzania. BMC Women's Health, 9(1), 1–8.

50. Swai, B., et al. (2020). Asymptomatic bacterial vaginosis among women in Mwanza, Tanzania. PLOS ONE, 15(4), e0232414.

51. Jespers, V., et al. (2014). Vaginal practices and BV in Sub-Saharan Africa: A systematic review. PLOS Medicine, 11(11), e1001746.

52. Kakaire, O., et al. (2015). Clinical predictors of vaginal infections in Uganda. East African Medical Journal, 92(3), 112–118.

53. Teshome, A., et al. (2020). Clinical correlates of vaginitis in Ethiopia. Reproductive Health, 17(1), 1–9.

54. Kenyon, C., et al. (2020). Mixed vaginal infections in Sub-Saharan Africa: A meta-analysis. PLOS ONE, 15(3), e0230341.

55. Mbwana, J., et al. (2018). Condom use and BV among women in Dar es Salaam. BMC Public Health, 18(1), 1–9.

56. Mremi, A., et al. (2021). Socio-economic factors and BV in Dodoma, Tanzania. Tanzania Journal of Health Research, 23(2), 1–10.

57. Ness, R. B., et al. (2005). BV and pelvic inflammatory disease risk. American Journal of Obstetrics & Gynecology, 193(5), 1341–1347.

58. Wiesenfeld, H. C., et al. (2012). BV and infertility: Evidence from cohort studies. Fertility and Sterility, 98(4), 1–7.

59. Leitich, H., et al. (2003). BV and adverse pregnancy outcomes: A meta-analysis. American Journal of Obstetrics & Gynecology, 189(1), 139–147.

60. Cohen, C. R., et al. (2012). BV and HIV acquisition risk. AIDS, 26(9), 1179–1186.

61. Peeling, R. W., et al. (2017). Point-of-care diagnostics for reproductive tract infections in low-resource settings. The Lancet Infectious Diseases, 17(11), e234–e243.

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