The Role of Dermatovenereology in the Diagnosis and Management of Bacterial Vaginosis: A Systematic Review

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Citation : Eldy, Amalia SR, Wardianti FA, Sitanggang MR, Hakiki NP. The Role of Dermatovenereology in the Diagnosis and Management of Bacterial Vaginosis: A Systematic Review. Medicinus. 2025;13(1):109–118
Keywords: Bacterial vaginosis; Dermatovenereology; Microscopy; Recurrence prevention
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Online First : 1 October 2023

Abstract

Background:
Bacterial vaginosis (BV) is a prevalent, recurrent cause of abnormal vaginal discharge with important sexual and reproductive health implications. Because symptoms overlap with candidiasis, trichomoniasis, cervicitis/STIs, and vulvar dermatoses, dermatovenereology services are central to accurate diagnosis and comprehensive care.
Methods:
A PRISMA-compliant systematic review searched PubMed, EMBASE, and Scopus from inception to September 1, 2023, using controlled vocabulary and keywords related to BV, diagnostic modalities (Amsel, Nugent/Gram stain, microscopy, molecular assays), and dermatovenereology/sexual health services. Screening, full-text eligibility, and narrative synthesis were performed; risk of bias was assessed using the Newcastle–Ottawa Scale.
Result:
From 729 records, 8 studies were included after deduplication, screening, and eligibility assessment. Studies consistently highlighted the value of objective diagnosis particularly in recurrent, atypical, or post-treatment presentations. NAAT-based testing was used mainly in referral settings and facilitated concurrent STI testing. First-line antibiotics (metronidazole or clindamycin) achieved short-term response, but recurrence was common; suppressive intravaginal metronidazole and newer recurrence-prevention approaches (e.g., astodrimer gel, Lactin-V) reduced relapse in selected populations.
Conclusions:
Dermatovenereology-led pathways that integrate objective testing, careful differential diagnosis, STI screening, and counseling can improve diagnostic precision and reduce BV recurrence.

Introduction

Bacterial vaginosis (BV) is the most common cause of abnormal vaginal discharge among reproductive-age women and remains a high-burden condition in everyday clinical practice.[1] Globally, BV affects roughly 1 in 4 women (pooled prevalence around 23–29% in many meta-analyses), and it is characterized by a shift from lactobacillus-dominant flora to a polymicrobial, anaerobe-rich vaginal microbiome.[2] Clinically, BV is associated with bothersome symptoms (thin gray-white discharge, malodor) yet can be asymptomatic in a substantial proportion of patients, which contributes to

underdiagnosis and recurrence.[3] Beyond symptoms, BV has meaningful downstream consequences: it is linked to increased susceptibility to sexually transmitted infections, and in pregnancy it has been associated with adverse outcomes such as preterm birth, making accurate diagnosis and effective management directly relevant to both gynecologic and sexual health care.[3]

Despite being common, BV remains diagnostically and therapeutically challenging. Standard diagnostic approaches, including Amsel criteria in the clinic and Nugent scoring on Gram stain, have limitations related to interobserver variability, access to microscopy, and overlap with other causes of vaginitis such as vulvovaginal candidiasis and trichomoniasis.[4] Recurrence is also a major clinical problem: even after first-line therapy (typically metronidazole or clindamycin), recurrence rates of 30% within 3 months and >50% within 6–12 months are frequently reported, driving repeated visits, antibiotic exposure, and persistent impact on quality of life.[5] These realities underscore the need for clinicians to recognize BV not only as a "*benign discharge syndrome*," but as a recurrent, microbiome-mediated condition with implications for reproductive outcomes, STI prevention, and antimicrobial stewardship.[6]

Dermatovenereology occupies a pivotal position in addressing these gaps because BV commonly presents in settings where genitourinary symptoms overlap with dermatologic and sexually transmitted conditions. Dermatovenereologists are often the first point of contact for patients with vulvovaginal complaints, recurrent "vaginitis," post-treatment persistence, or coexisting STIs and inflammatory dermatoses of the vulva.[7] This systematic review therefore examines the role of dermatovenereology across the BV care pathway—how dermatovenereologists contribute to accurate differentiation from other vulvovaginal disorders, optimize diagnostic strategies (including point-of-care microscopy where available), manage recurrent and refractory disease, and integrate partner/behavioral counseling and STI screening in a syndromic framework.[8] By synthesizing current evidence, we aim to clarify clinically actionable practices that improve diagnostic precision, reduce recurrence, and strengthen comprehensive sexual health management in real-world dermatovenereology services.

Material And Methods

Study design and reporting framework

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.[9] The study selection process was documented using a PRISMA flow diagram, detailing identification, screening, eligibility assessment, and final inclusion of studies.

Data sources and search strategy

A comprehensive literature search was performed in PubMed, EMBASE, and Scopus from database inception to September 1, 2023. The search strategy combined controlled vocabulary (e.g., MeSH in PubMed and Emtree in EMBASE) and free-text keywords related to BV and dermatovenereology/sexual health services. Core concepts included terms such as *"bacterial vaginosis," "vaginal dysbiosis," "Gardnerella," "Amsel," "Nugent," "microscopy," "dermatovenereology," "venereology," "sexually transmitted infections,"* and *"vulvovaginitis."* Reference lists of included articles and relevant reviews were additionally hand-searched to identify any eligible studies not captured in the database search.

Study selection, data extraction, and synthesis

All retrieved records were exported to a reference management platform and duplicates were removed prior to screening. All reviewers independently performed study selection, first by title/abstract screening followed by full-text

eligibility assessment according to predefined inclusion and exclusion criteria.

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Data extraction

Data were extracted using a standardized form capturing study characteristics (design, setting, population), BV diagnostic approach (Amsel criteria, Nugent scoring, point-of-care microscopy, molecular methods), management strategies (first-line treatment, recurrence strategies, adjunctive measures), and dermatovenereology-specific contributions (differential diagnosis with STIs/vulvar dermatoses, STI screening integration, counseling, referral pathways).

Risk of bias analysis

Risk of bias for included studies was assessed using the Newcastle–Ottawa Scale (NOS), with studies categorized as having low-to-moderate risk of bias based on total scores and domain-level performance.

Data analysis

Findings were synthesized narratively and organized by clinically relevant themes. A quantitative meta-analysis was not performed because of substantial clinical and methodological heterogeneity across included studies, including variability in diagnostic criteria, outcome definitions (e.g., cure vs recurrence at different timepoints), populations (pregnant vs non-pregnant, symptomatic vs asymptomatic, STI co-infection), interventions (antibiotic regimens, suppressive therapy, adjuncts), and study designs.

Result

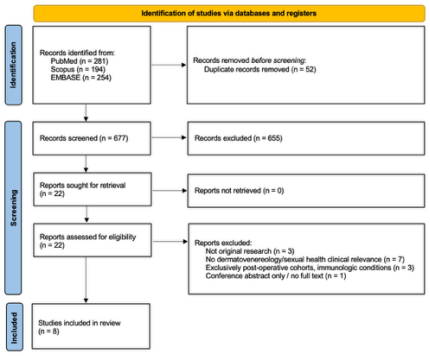

Figure 1. PRISMA flow chart.

A total of 729 records were identified through database searching (PubMed, n = 281; Scopus, n = 194; EMBASE, n = 254), after which 52 duplicate records were removed prior to screening, leaving 677 records screened; 655 records were excluded at this stage, and 22 reports were sought for retrieval and successfully retrieved (n not retrieved = 0), with all 22 reports assessed for eligibility; of these, 14 reports were excluded (not original research, n = 3; no dermatovenerology/sexual health clinical relevance, n = 7; exclusively post-operative cohorts or immunologic conditions, n = 3; conference abstract only/no full text, n = 1), resulting in 8 studies included in the final review (Figure 1).[10–17]

Diagnosis

Across the included studies, BV most presented to dermatovenereology services as recurrent malodor and thin discharge, “persistent vaginitis” despite prior empiric antifungals, or mixed vulvovaginal symptoms occurring alongside suspected or confirmed STIs. A consistent finding was that dermatovenereologists frequently encountered diagnostic overlap with vulvovaginal candidiasis, trichomoniasis, cervicitis/STI-related discharge, and inflammatory or eczematous vulvar dermatoses, making syndromic management alone prone to misclassification. Several studies emphasized that careful clinical history

(recent antibiotics, douching/intravaginal products, new partners, menstrual association, prior recurrence patterns) and targeted vulvar examination helped identify mimickers such as contact dermatitis or lichen simplex while still pursuing BV confirmation when discharge/odor were prominent.

Most studies reported using Amsel criteria as the primary clinic-based approach (typical elements: homogeneous discharge, pH >4.5, positive whiff test, and clue cells), with bedside wet-mount microscopy being a key value-add in dermatovenereology settings that had microscopy available. Where Gram stain capability existed,[10,12] Nugent scoring was commonly used to confirm diagnosis or adjudicate equivocal Amsel findings, especially in recurrent or atypical cases. Clinically, the review findings converged on a practical pattern: Amsel criteria supported rapid decision-making for symptomatic patients, while Nugent scoring improved diagnostic confidence when symptoms were mild, when discharge was absent but odor predominated, or when prior empiric therapy had altered clinical signs.[10–12]

A smaller subset of studies incorporated molecular/NAAT-based assays for BV-associated organisms and lactobacilli patterns, typically in referral centers or for recurrent/persistent disease.[10–17] These studies highlighted two clinically relevant advantages for dermatovenereology practice: (1) improved detection when microscopy expertise or immediate slide review was limited, and (2) streamlined concurrent STI testing (e.g., chlamydia/gonorrhea ± trichomonas, depending on platform and local pathways) in the same visit, which is particularly relevant in venereology clinics.

Table 1. Diagnosis details reported in the included clinical studies.

Study (year)	Design / population (human)	N	BV case definition at enrollment	Cure/recurrence definition used
Andres et al. (1992)	Prospective randomized double-blind trial; symptomatic BV	60 randomized; 46 completed	"Symptoms of BV" (specific diagnostic criteria not detailed in abstract)	"Improvement or cure" at first follow-up (criteria not detailed in abstract)
Paavonen et al. (2000)	Randomized trial; women with BV	399 enrolled; 233 evaluable	BV diagnosis stated, but enrollment criteria not fully specified in abstract	Clinical outcome based on amine odor + clue cells
Sobel et al. (2001)	Treatment comparison; women with "clinical diagnosis of BV"	384 treated (evaluable: ovule n=204; cream n=180)	"Clinical diagnosis of BV" (specific enrollment criteria not detailed in abstract)	Cure endpoints defined as resolution of 2 of 3 diagnostic criteria (first follow-up) and 3 of 3 criteria (second follow-up)
Sobel et al. (2006)	Multicenter recurrence-prevention RCT; women with recurrent BV	157 eligibles; 112 randomized after response to open-label gel	Recurrent symptomatic BV, detailed baseline diagnostic criteria not specified in abstract	Recurrent symptomatic BV during suppression (1-6 wks) and follow-up (12 wks off-therapy)
Livengood et al. (2007)	Multicenter randomized double-blind placebo-controlled trial	235	All 5 required for diagnosis/cure: clue cells ≥20%, +whiff, homogeneous thin discharge, pH>4.5, and Nugent ≥4	"Cure" required absence of all five criteria at 21–30 days (FDA-style strict endpoint)
Hillier et al. (2017)	Phase 2 randomized double-blind placebo-controlled study	215 enrolled; mITT 188	Required all Amsel criteria (discharge, pH ≥4.7, clue cells ≥20%, +whiff); baseline Nugent ≥4 noted	Primary: clinical cure (normalization of discharge, amine odor, clue cells) at 21–30 days; secondary: Nugent 0–3 microbiologic cure
Cohen et al. (2020)	Randomized double-blind placebo-controlled phase 2b (recurrence prevention)	228 randomized (152 vs 76)	Eligibility required completing a course of vaginal metronidazole gel after a BV diagnosis (enrollment diagnostic specifics not detailed in abstract)	Recurrence of BV by week 12 (primary) and by week 24 (secondary)
Schwebke et al. (2021)	Phase 3 randomized controlled recurrence-prevention trial	864 enrolled; randomized 295 vs 291 after induction response	BV diagnosis + recurrent history; induction with oral metronidazole before randomization (baseline diagnostic criteria not detailed in abstract)	BV recurrence by week 16; recurrence also assessed by Amsel components and Nugent 7–10 as secondary measures

Table 2. Management regimens and outcomes from the same included studies.

Study (year)	Regimen(s) evaluated	Comparator	Key outcome(s)
Andres et al. (1992)	Clindamycin 2% vaginal cream 5 g qHS ×7 days	Metronidazole 500 mg PO BID ×7 days	Improvement/cure at first follow-up: 22/23 (97%) clinda cream vs 19/23 (83%) oral metronidazole; overall cure rates reported as comparable
Paavonen et al. (2000)	Clindamycin ovules 100 mg intravaginal ×3 days (+ placebo oral)	Metronidazole 500 mg PO BID ×7 days (+ placebo ovules)	Cure (amine odor + clue cells basis): 77/113 (68.1%) clinda ovules vs 80/120 (66.7%) metronidazole; more treatment-related AEs reported with metronidazole (notably systemic symptoms)
Sobel et al. (2001)	Clindamycin ovules ×3 days	Clindamycin cream ×7 days	Cure rates: 53.7% (109/204) ovules vs 47.8% (85/180) cream (no significant difference reported in abstract)
Sobel et al. (2006)	After 10-day open-label metrogel response: metronidazole vaginal gel twice weekly ×16 weeks	Placebo gel twice weekly ×16 weeks	Recurrence during suppression: 25.5% metrogel vs 59.1% placebo; over 28 weeks: 51.0% vs 75% recurrence; secondary vaginal candidiasis more common with metrogel
Livengood et al. (2007)	Tinidazole 1 g PO daily ×5 days OR tinidazole 2 g PO daily ×2 days	Placebo	Primary strict cure at 21–30 days: 36.8% (1 g ×5d) and 27.4% (2 g ×2d) vs 5.1% placebo
Hillier et al. (2017)	Secnidazole 2 g single oral dose OR 1 g single oral dose	Placebo	ITT clinical cure: 65.3% (2 g) vs 49.3% (1 g) vs 19.4% placebo; microbiologic and therapeutic cure also favored secnidazole
Cohen et al. (2020)	After completing vaginal metronidazole gel: Lactin-V (L. crispatus CTV-05) intravaginal ×11 weeks	Placebo	BV recurrence by week 12: 30% (46/152) Lactin-V vs 45% (34/76) placebo (RR 0.66); recurrence by week 24 RR 0.73
Schwebke et al. (2021)	Induction: metronidazole 500 mg PO BID ×7 days, then Amsterdime 1% gel 5 g every second day ×16 weeks	Placebo gel (post-induction)	Recurrence by week 16: 44.2% (130/294) amsterdime vs 54.3% (158/291) placebo; symptom recurrence also lower with amsterdime; candidiasis/UTI occurred more often with amsterdime

Management

First-line treatment patterns in the included studies largely aligned with widely used guideline-based regimens, with dermatovenereologists selecting therapy based on symptom severity, recurrence history, tolerance, and patient preference. The most frequently reported regimens were metronidazole 500 mg orally twice daily for 7 days, metronidazole 0.75% vaginal gel (5 g) once daily for 5 days, and clindamycin 2% vaginal cream (5 g) at bedtime for 7 days; several studies also reported clindamycin 300 mg orally twice daily for 7 days as an alternative when intravaginal therapy was unsuitable.[12,14,16] Studies noted similar short-term symptom resolution across oral and topical options, but oral metronidazole was often favored when coinfection risk was high or when patients preferred a systemic approach, while topical regimens were commonly chosen to reduce systemic adverse effects (e.g., nausea, metallic taste) or when adherence to oral medication was a concern.[12,16,17]

Management of recurrent or persistent BV emerged as the most dermatovenereology-relevant theme. Across studies, repeated short courses alone were associated with frequent relapse, prompting use of suppressive strategies after induction therapy. The most consistently described suppressive regimen was metronidazole 0.75% vaginal gel (5 g) twice weekly for 4–6 months following an initial standard course (often oral metronidazole 500 mg twice daily for 7 days). Some studies described combination approaches aimed at addressing biofilm-associated persistence, commonly using an induction antibiotic course followed by intravaginal boric acid 600 mg once daily for 14–21 days, then

transitioning to suppressive metronidazole gel (twice weekly) for several months, typically reserved for highly recurrent cases in specialist clinics. Evidence for adjunctive probiotics was mixed: a number of studies reported improved patient-reported outcomes or reduced recurrence in selected cohorts, while others found inconsistent benefit, supporting a cautious, individualized approach.

Dermatovenereology-led care also emphasized behavioral and sexual health integration as part of BV management: counseling to avoid douching and irritating intravaginal products, addressing condom use and exposure patterns that may coincide with recurrence, and ensuring appropriate STI screening when indicated by risk profile or symptoms. Most included studies did not support routine treatment of male partners to prevent recurrence but did highlight the need to evaluate and treat trichomoniasis or other STIs when present, because persistent symptoms after BV therapy were frequently explained by missed coinfection or coexisting vulvar dermatoses. Special situations were handled with regimen selection rather than fundamentally different goals: in pregnancy, studies favored established antibiotics (commonly metronidazole 500 mg orally twice daily for 7 days or clindamycin 300 mg orally twice daily for 7 days) while reinforcing clinically driven follow-up if symptoms persisted.

Risk of bias assessment

Table 3. Summary for Newcastle–Ottawa Scale Risk of Bias Assessment.

Study (year)	Selection	Comparability	Outcome/ Exposure	Total	Overall risk of bias
Hillier et al. (2017)	3	2	3	8	Low
Andres et al. (1992)	2	1	2	5	Moderate
Schwebke et al. (2021)	4	2	2	8	Low
Sobel et al. (2001)	2	1	3	6	Moderate
Cohen et al. (2020)	3	1	3	7	Low
Paavonen et al. (2000)	3	1	2	6	Moderate
Livengood et al. (2007)	4	1	2	7	Low
Sobel et al. (2006)	3	2	2	7	Low

The NOS assessment showed moderate-to-low risk of bias across the included studies, with total scores ranging from 5 to 8 (Table 3). Most studies scored strongest in Selection and Outcome/Exposure domains, reflecting generally clear case definitions and outcome ascertainment, while Comparability was more variable due to inconsistent adjustment for key confounders.

Discussion

This systematic review highlights that BV is not only common, but also diagnostically and therapeutically “high-friction” in real-world practice. Across included studies, objective diagnostic frameworks (Amsel components, Gram stain/Nugent scoring, and molecular testing) were repeatedly tied to clearer clinical decision-making than symptom-based treatment alone. Clinically, this matters because BV symptoms overlap with vulvovaginal candidiasis, trichomoniasis, cervicitis or STIs, and noninfectious vulvar dermatoses; without

objective testing, patients can cycle through empiric antifungals or repeated short antibiotic courses.[18] In practical terms, incorporating point-of-care microscopy where available and/or ensuring access to Gram stain interpretation can shorten time to correct diagnosis and reduce inappropriate therapy, especially in referral dermatovenereology clinics that frequently see “recurrent vaginitis” presentations.[19]

A major finding of this review is the recurrent nature of BV and the need to treat recurrence as an expected clinical problem rather than a rare complication. The management trials in our synthesis demonstrate that although initial response rates can be favorable with standard regimens (e.g., metronidazole or clindamycin), recurrence remains common, and structured maintenance strategies can meaningfully reduce relapse.[20] For example, in a suppressive-therapy trial, recurrence during suppression was 25.5% with twice-weekly metronidazole gel versus 59.1% with placebo, and cumulative recurrence over longer follow-up still remained substantial (51% vs 75%).[17] These numbers help frame realistic counseling: many patients will improve with first-line therapy, but a sizeable fraction will relapse, and early transition to a planned suppressive approach may prevent repeated clinic visits, repeated antibiotic exposure, and persistent symptoms that undermine quality of life.[21]

Importantly, newer and adjunctive strategies in the included studies suggest that recurrence prevention is modifiable, though not eliminated. In a phase 3 recurrence-prevention trial using astodrimer gel after induction therapy, BV recurrence by week 16 was 44.2% versus 54.3% with placebo.[15] Similarly, microbiome-directed approaches showed promise: following metronidazole induction, Lactin-V reduced recurrence by week 12 to 30% compared with 45% on placebo (relative risk 0.66).[11] These findings support a dermatovenereology model that goes beyond “treat and discharge” and instead views BV as a microbiome-mediated, biofilm-associated disorder where maintenance regimens, recurrence prevention, and follow-up are part of standard care, particularly for patients with multiple prior episodes.[22]

From a safety and counseling standpoint, the review also reinforces that selecting regimens in dermatovenereology should balance efficacy with tolerability and downstream effects. Comparative trials showed broadly similar cure outcomes between common antibiotic options in the short term (e.g., clindamycin ovules vs oral metronidazole), but with differences in adverse-effect profiles that influence adherence and patient preference.[23] At the same time, suppression strategies may increase the

likelihood of secondary issues such as vulvovaginal candidiasis in some patients, underscoring the value of dermatovenereology expertise in managing mixed infections and vulvar dermatoses that can complicate the course.[24] Clinically, these data argue for an integrated pathway: confirm BV objectively when possible, screen for and treat coinfections when indicated, use guideline-concordant first-line therapy.

Study limitation

This review has several limitations that affect the certainty and generalizability of its conclusions. First, the included studies were heterogeneous in diagnostic definitions (Amsel-based, Nugent-based, mixed endpoints), outcome measures (clinical cure vs microbiologic cure vs time-to-recurrence), and follow-up duration, which limits direct comparability across trials and was a key reason meta-analysis was not performed. Second, many trials enrolled symptomatic, non-pregnant, clinic-based populations, which may not fully represent asymptomatic BV, pregnant patients, or community settings. Third, recurrence-prevention studies often required participants to respond to induction therapy before randomization, potentially enriching the sample for treatment responders and underestimating failure rates seen in unselected practice.

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Conclusion

The evidence synthesized in this review supports dermatovenereology as a clinically important specialty for optimizing BV care across the continuum from diagnosis to long-term management. Objective diagnostic strategies (Amsel components supported by microscopy and/or Nugent scoring, with molecular testing in selected settings) help reduce misclassification in patients with overlapping vulvovaginal complaints, while management evidence shows that BV should be approached as a high-recurrence condition where maintenance strategies and validated adjuncts can reduce relapse. Clinically, a dermatovenereology-led integrated model offers a pragmatic pathway to improve symptom control, reduce repeated empiric treatments, and strengthen comprehensive sexual health care.

Acknowledgment

None,

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