



A Review on Leukorrhea: Types, Causes, Diagnosis, and Treatment

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ABSTRACT

Leukorrhea, commonly known as vaginal discharge, is one of the most frequent gynecological concerns among women of reproductive age. It may present as either a physiological phenomenon associated with hormonal changes or as a pathological condition indicative of infections, inflammation, or systemic disorders. The condition not only affects women's reproductive health but also has significant psychosocial and economic implications, particularly in developing regions where stigma and lack of awareness hinder timely diagnosis and treatment. This review comprehensively discusses the classification, etiological factors, diagnostic approaches, and management strategies for leukorrhea, emphasizing the relationship between vaginal microbiota and reproductive well-being. Furthermore, it highlights contemporary diagnostic techniques including molecular assays, and explores recent advances in treatment modalities such as probiotics, phytotherapeutics, and antimicrobial stewardship. The review concludes with recommendations for integrated management approaches and future research directions aimed at improving women's reproductive health outcomes.

1. Introduction

Leukorrhea, also termed *fluor albus*, refers to an abnormal or excessive vaginal discharge not associated with blood. It represents one of the most prevalent gynecological symptoms worldwide, affecting nearly



75% of women at least once during their reproductive lifespan (WHO, 2023). While physiological leukorrhea is an indicator of normal vaginal function and self-cleansing mechanisms, pathological leukorrhea may reflect underlying infections such as bacterial vaginosis, vulvovaginal candidiasis, trichomoniasis, or non-infectious etiologies like allergic and irritant vaginitis.

The significance of leukorrhea extends beyond physical discomfort. Persistent abnormal discharge can lead to infertility, pelvic inflammatory disease, and adverse pregnancy outcomes, besides affecting quality of life due to embarrassment and social stigma. Despite being common, leukorrhea remains underreported in low-resource settings due to cultural taboos, self-medication, and lack of access to proper healthcare.

This review aims to provide an in-depth understanding of leukorrhea, its pathogenesis, diagnostic framework, and therapeutic management, while integrating recent insights from microbiological and molecular studies.

2. Classification and Pathophysiology

Leukorrhea is broadly categorized into **physiological** and **pathological** forms.

2.1 Physiological Leukorrhea

Physiological leukorrhea is a natural occurrence resulting from cyclical hormonal variations, mainly estrogen and progesterone. It is typically colorless to whitish, odorless, and maintains vaginal lubrication. The discharge serves to flush out necrotic epithelial cells and preserve the acidic vaginal environment (pH < 4.5), primarily maintained by *Lactobacillus* spp. such as *L. crispatus*, *L. gasseri*, *L. iners*, and *L. jensenii*. These species produce lactic acid and hydrogen peroxide, which inhibit pathogen colonization. Variations occur during ovulation, pregnancy, and sexual arousal, reflecting hormonal balance and reproductive health.

2.2 Pathological Leukorrhea

Pathological leukorrhea, conversely, is characterized by yellowish, greenish, or grayish discharge, often with a foul odor and associated symptoms such as pruritus, dysuria, and dyspareunia. Its underlying causes may be **infectious** or **non-infectious**.

2.2.1 Non-infectious causes



Non-infectious leukorrhea may arise from allergic or irritant vaginitis, foreign bodies, vulvar vestibulitis, or chemical exposure from hygiene products. Hypersensitivity to spermicides, latex, or soaps can trigger mucosal inflammation leading to discharge.

2.2.2 Infectious causes

Major infectious etiologies include:

- **Bacterial Vaginosis (BV):** An imbalance of normal flora leading to overgrowth of *Gardnerella vaginalis* and *Atopobium vaginae*. Associated with a fishy odor and elevated vaginal pH (>4.5).
- **Candidiasis:** Caused by *Candida albicans* or *C. glabrata*, producing thick, curdy discharge and pruritus. Risk factors include diabetes, antibiotic use, pregnancy, and hormonal therapy.
- **Trichomoniasis:** A sexually transmitted infection caused by *Trichomonas vaginalis*, often with frothy, yellow-green discharge and vulvar irritation.
- **Aerobic Vaginitis:** Involves pathogens like *Escherichia coli* or *Streptococcus agalactiae*, accompanied by inflammation and epithelial shedding.

3. Prevalence and Epidemiology

Leukorrhea has a global prevalence rate of 60–80% among women of reproductive age, with the highest incidence in tropical and subtropical countries. Studies in South Asia have reported prevalence rates up to 79% among adolescent girls. Risk factors include poor menstrual hygiene, multiple sexual partners, low socioeconomic status, and limited awareness of genital health. In rural Indian communities, women often perceive leukorrhea as a sign of weakness rather than infection, delaying medical consultation.

4. Diagnostic Approaches

4.1 Clinical Evaluation

Diagnosis begins with detailed history and physical examination. Key parameters include the **color**, **consistency**, **odor**, and **amount** of discharge, along with associated symptoms.

4.2 Laboratory and Molecular Diagnostics

- **Vaginal pH testing:** Physiological discharge typically maintains pH <4.5; values above this suggest infection.



- **Microscopy:** Wet mount and KOH preparations help detect yeast cells, *Trichomonas*, or clue cells (in BV).
- **Gram staining and Nugent scoring:** Provide semi-quantitative evaluation of bacterial flora.
- **Culture:** Useful in recurrent or resistant cases to identify specific pathogens.
- **PCR-based assays:** Modern molecular tests detect *Gardnerella*, *Candida*, *Trichomonas*, and mixed infections with high sensitivity.
- **Next-generation sequencing (NGS):** Increasingly applied to characterize vaginal microbiota diversity and dysbiosis patterns.

5. Treatment and Management

5.1 General Measures

Maintaining genital hygiene, wearing breathable cotton garments, and avoiding irritant chemicals are essential preventive strategies. Awareness programs and early screening can significantly reduce morbidity.

5.2 Pharmacological Therapy

Treatment depends on etiology:

- **Bacterial vaginosis:** Metronidazole (500 mg twice daily for 7 days) or clindamycin cream.
- **Candidiasis:** Topical azoles or oral fluconazole.
- **Trichomoniasis:** Oral metronidazole or tinidazole.
- **Aerobic vaginitis:** Tailored antibiotic therapy guided by culture and sensitivity.

5.3 Probiotic and Phytotherapeutic Interventions

Recent studies support the use of probiotics containing *Lactobacillus* spp. to restore normal flora and reduce recurrence. Herbal formulations (e.g., *Azadirachta indica*, *Curcuma longa*, *Aloe vera*) exhibit antimicrobial and anti-inflammatory properties with fewer side effects.



6. Discussion

Leukorrhea represents an intersection between infectious disease, reproductive health, and socio-cultural factors. Despite being common, it remains under-researched, particularly regarding its microbial ecology and role of immune modulation. Integration of microbiome research into clinical diagnosis is reshaping perspectives on vaginal health. However, inappropriate antibiotic use contributes to resistance and microbiota disruption, underscoring the need for rational therapy.

Multidisciplinary approaches involving gynecologists, microbiologists, and public health professionals are essential for effective management. Awareness, education, and community-based screening can empower women to seek timely medical attention.

7. Future Perspectives and Recommendations

Future research should focus on:

- Development of **rapid point-of-care molecular diagnostics** for low-resource settings.
- Exploration of **microbiome-based therapies**, including engineered probiotics.
- Longitudinal studies linking vaginal dysbiosis with infertility and pregnancy outcomes.
- Formulation of national guidelines on **leukorrhea management** and **antimicrobial resistance control**.

Public health programs must integrate reproductive health education into primary care to address stigma and misinformation.

8. Conclusion

Leukorrhea, though often benign, can serve as an indicator of underlying reproductive tract infections and systemic disorders. Understanding its multifactorial etiology is essential for precise diagnosis and effective treatment. With the advent of molecular diagnostics and probiotic therapy, the clinical approach to leukorrhea is transitioning from symptom-based management to microbiome-centered care. Strengthening awareness and evidence-based medical practices can significantly improve women's reproductive and overall health outcomes.



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