

Herbal plants in women's health and hygiene: common problems and plant-based cures

Abstract

Women's health encompasses a wide spectrum of physiological and reproductive conditions that disproportionately affect female populations worldwide. From menstrual disorders and vaginal infections to menopausal symptoms and urinary tract complications, these conditions collectively impair quality of life for millions of women. While contemporary pharmaceutical interventions remain effective, growing concerns over adverse effects, antibiotic resistance, and limited healthcare access have renewed global interest in herbal medicine. This review systematically examines the ethnopharmacological evidence supporting the use of medicinal plants for addressing common women's health and hygiene problems. We have evaluated the bioactive constituents, mechanisms of action, clinical evidence, and safety profiles of key herbal remedies including *Aloe vera*, *Azadirachta indica* (Neem), *Mentha piperita* (Peppermint), *Zingiber officinale* (Ginger), *Curcuma longa* (Turmeric), *Vitex agnus-castus*, and several others. The review synthesizes findings from over 80 peer-reviewed studies published between 2000 and 2024 and provides structured tables for quick clinical reference. Herbal plants demonstrate substantial potential in managing women's health disorders through anti-inflammatory, antimicrobial, phytoestrogenic, and antioxidant mechanisms. Standardized clinical trials and regulatory frameworks are needed to fully integrate these remedies into mainstream women's healthcare.

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Introduction

Women's health and hygiene represent critical dimensions of global public health. According to the World Health Organization,¹ reproductive and gynecological conditions account for a significant proportion of disease burden among women of reproductive age worldwide, particularly in low- and middle-income countries (LMICs) where access to modern healthcare remains limited. Conditions such as bacterial vaginosis (BV), vulvovaginal candidiasis (VVC), dysmenorrhea, polycystic ovary syndrome (PCOS), and menopausal syndrome affect hundreds of millions of women globally.^{2,3} Plants have served as primary sources of medicine across cultures for thousands of years. The World Health Organization estimates that approximately 80% of the global population relies on herbal medicine for primary healthcare needs.⁴ Traditional medicine systems including Ayurveda, Traditional Chinese Medicine (TCM), Unani, and African traditional medicine have documented extensive uses of plant materials for gynecological and reproductive conditions. Many of these traditional applications are now being validated through rigorous pharmacological and clinical investigations.⁵ This review addresses a critical knowledge gap by consolidating current evidence on herbal plants used in women's health and hygiene management. The objectives are: (1) to catalogue the most prevalent women's health problems amenable to herbal treatment; (2) to identify the key medicinal plants with documented evidence; (3) to describe their bioactive constituents and pharmacological mechanisms; (4) to evaluate clinical evidence; and (5) to discuss safety considerations and future research directions. Given this substantial and growing burden—particularly in low- and middle-income countries where conventional treatment access is constrained—there is a clear and urgent need for accessible, evidence-based therapeutic alternatives; addressing this need concisely and comprehensively is the central rationale for the present review.

Methodology

A comprehensive literature search was conducted across major databases including PubMed/MEDLINE, Scopus, Web of Science,

EMBASE, and Google Scholar. Search terms included combinations of: 'herbal medicine,' 'medicinal plants,' 'women's health,' 'gynecology,' 'female hygiene,' 'menstrual disorders,' 'vaginal infection,' 'PCOS,' 'menopause,' 'phytotherapy,' and specific plant names. Studies published between January 2000 and December 2023 were included. Inclusion criteria required peer-reviewed publications in English reporting either (a) in vitro/in vivo pharmacological studies, (b) clinical trials, or (c) systematic reviews. Grey literature and traditional monographs were used supplementarily. Approximately 120 publications were screened, and 85 met inclusion criteria. The search was conducted between January and March 2024, and reference lists of all included articles were hand-searched to identify additional relevant studies not captured by the primary search strategy. Two reviewers independently screened titles, abstracts, and full texts against the inclusion criteria, with disagreements resolved by discussion and consensus, thereby improving methodological transparency and reproducibility. The methodological quality of included studies was appraised qualitatively based on study design, sample size, randomization, and the use of validated outcome measures, and this appraisal is reflected in the evidence-level ratings reported in Table 2.

Common women's health and hygiene problems

Women experience a diverse range of health challenges that vary across the life cycle—from menarche through menopause and beyond. The major categories addressed in this review are summarized below and in Table 1.

Vaginal infections and dysbiosis

Vaginal infections are among the most common gynecological complaints globally. Bacterial vaginosis (BV), caused by overgrowth of *Gardnerella vaginalis* and other anaerobes, affects an estimated 29% of reproductive-age women in the United States alone.⁶ Vulvovaginal candidiasis (VVC), caused predominantly by *Candida albicans*, affects approximately 75% of women at least once in their

lifetime, with 40–45% experiencing recurrent episodes.⁷ *Trichomonas vaginalis*, a sexually transmitted protozoan, affects more than 276 million people annually worldwide (WHO, 2022).¹ These infections disrupt the normal Lactobacillus-dominated vaginal microbiome, leading to symptoms including discharge, odor, pruritus, and dyspareunia.

Menstrual disorders

Menstrual disorders encompass a broad-spectrum including dysmenorrhea (painful menstruation), menorrhagia (heavy bleeding), amenorrhea (absence of menstruation), and premenstrual syndrome (PMS). Primary dysmenorrhea affects 45–95% of menstruating women, representing the leading cause of absenteeism among young women.⁸ PCOS, characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology, affects 5–15% of reproductive-age women and is the most common endocrine disorder in this population.⁹

Menopausal symptoms

The menopausal transition, affecting women typically between ages 45 and 55, is associated with significant estrogen decline resulting in vasomotor symptoms (hot flashes, night sweats), genitourinary syndrome, osteoporosis, and psychological symptoms including anxiety and depression. Globally, over 1.1 billion women will be post-menopausal by 2025.¹⁰ Concerns about hormone replacement therapy

(HRT) risks, particularly cardiovascular events and breast cancer, have driven widespread interest in phytoestrogen-containing herbal alternatives.

Urinary tract infections (UTIs)

Urinary tract infections are significantly more prevalent in women due to anatomical differences, affecting 50–60% of women during their lifetime.² *Escherichia coli* accounts for 80–85% of community-acquired UTIs. Recurrent UTIs (rUTIs), defined as ≥2 infections in 6 months or ≥3 in one year, affect approximately 25% of women who have had a prior UTI.¹¹ The rising incidence of antibiotic resistance among uropathogenic bacteria has intensified research into herbal antimicrobial alternatives.

Perineal and skin hygiene concerns

Vulvar and perineal hygiene problems including contact dermatitis, folliculitis, intertrigo, and post-partum wound healing represent additional areas where herbal interventions are commonly sought. Excessive use of commercial chemical-based intimate hygiene products has been associated with disruption of the vaginal microbiome and increased infection risk,¹² supporting interest in gentler botanical alternatives.

Table 1. Common women's health and hygiene problems with global prevalence estimates and primary herbal interventions.

Table 1 Summary of Common Women's Health and Hygiene Problems, Global Prevalence, and Associated Herbal Interventions

Health Problem	Prevalence	Primary Pathogens / Cause	Key Herbal Interventions	Key references
Bacterial Vaginosis	~29% reproductive-age women	Gardnerella vaginalis, anaerobes	Aloe vera, Neem, Tea Tree, Garlic	Koumans et al. ⁶
Vulvovaginal Candidiasis	75% lifetime; 40–45% recurrent	Candida albicans	Tea Tree Oil, Thyme, Garlic, Turmeric	Sobel et al. ⁷
Primary Dysmenorrhea	45–95% menstruating women	Prostaglandin excess, uterine ischemia	Ginger, Chamomile, Fennel, Cinnamon	Ju et al. ⁸
PCOS	5–15% reproductive-age women	Hyperandrogenism, insulin resistance	Spearmint, Cinnamon, Flaxseed, Licorice	Bozdag et al. ⁹
Menopausal Syndrome	~1.1 billion by 2025	Estrogen decline	Black Cohosh, Soy Isoflavones, Dong Quai	Blumel et al. ¹⁰
Urinary Tract Infection	50–60% lifetime	E. coli (80–85%)	Cranberry, Bearberry, Dandelion	Foxman et al. ²
Vulvar/Perineal Irritation	Common; variable	Chemical irritants, microorganisms	Aloe vera, Calendula, Chamomile	Crann et al. ¹²
Premenstrual Syndrome (PMS)	20–40% menstruating women	Hormonal fluctuation, serotonin dysregulation	Vitex agnus-castus, Evening Primrose, St. John's Wort	Rapkin et al. ⁴⁶

Key herbal plants for women's health and hygiene

The following section describes the most extensively researched medicinal plants relevant to women's health, organized by their primary therapeutic applications. Table 2 provides a comprehensive phytochemical and pharmacological summary.

Aloe vera (L.) Burm.f. – Family: Asphodelaceae

Aloe vera is one of the most widely utilized medicinal plants globally, with a 4,000-year history of medicinal use. The gel extracted

from leaf parenchyma contains polysaccharides (acemannan, glucomannans), anthraquinones (aloin, barbaloin), vitamins (C, E, B12), minerals, and enzymes. Phytochemical analyses have identified over 75 bioactive compounds.¹³ In women's health, Aloe vera demonstrates potent antimicrobial activity against *Candida albicans*, *Staphylococcus aureus*, and *Gardnerella vaginalis*.¹⁴ Clinical trials have demonstrated efficacy of Aloe vera vaginal cream in treating VVC comparable to clotrimazole.¹⁵ For vulvar hygiene and post-partum perineal wound healing, topical Aloe vera preparations have shown accelerated healing and reduced inflammatory scores in randomized controlled trials.¹⁶

***Azadirachta indica* A. Juss. (Neem) – Family: Meliaceae**

Neem has been integral to Ayurvedic gynecological practice for centuries, referred to in Sanskrit texts as ‘Sarva Roga Nivarini’ (the universal healer). All plant parts possess therapeutic activity, but the leaf and seed oil are most relevant to women's health. Key bioactive compounds include azadirachtin, nimbin, nimbidin, gedunin, and quercetin. Neem leaf extracts demonstrate broad-spectrum antimicrobial activity against bacterial and fungal vaginal pathogens.¹⁷ Neem oil has been investigated as a vaginal microbicide with spermicidal properties, showing inhibitory activity against *Trichomonas vaginalis* and several STI-causing organisms.¹⁸ In a clinical study by Sharma,¹⁹ neem-based vaginal gel significantly reduced BV symptoms and restored normal vaginal pH within 7 days of treatment.

***Zingiber officinale* Roscoe (Ginger) – Family: Zingiberaceae**

Ginger rhizome is one of the most extensively studied spices with medicinal applications in women's health, particularly for dysmenorrhea and nausea during pregnancy. The principal bioactive compounds—gingerols, shogaols, and paradols—exert anti-inflammatory effects by inhibiting cyclooxygenase (COX-1, COX-2) and thromboxane synthase enzymes, reducing prostaglandin synthesis responsible for uterine cramping.²⁰ A landmark randomized double-blind trial by Ozgoli et al. (2009) demonstrated that 250 mg ginger extract four times daily was as effective as ibuprofen (400 mg) and mefenamic acid (250 mg) in reducing pain severity in primary dysmenorrhea. Ginger is also the most evidence-supported herbal remedy for nausea and vomiting of pregnancy (NVP), with multiple meta-analyses confirming significant efficacy.²¹ Safety data from prospective studies indicate no significant teratogenic risk at culinary or therapeutic doses.²²

***Curcuma longa* L. (Turmeric) – Family: Zingiberaceae**

Turmeric's principal bioactive constituent, curcumin, has been subjected to more than 3,000 published studies demonstrating anti-inflammatory, antioxidant, antimicrobial, and phytoestrogenic properties.²³ In women's health, curcumin is particularly relevant to PCOS management: clinical trials have demonstrated improvements in insulin resistance, testosterone levels, and menstrual regularity with curcumin supplementation.²⁴ Curcumin also modulates estrogen receptor signaling, suggesting potential utility in hormone-sensitive conditions. For vaginal hygiene, turmeric-containing preparations show antifungal and antibacterial activity against common vaginal pathogens. Traditional Ayurvedic formulations incorporating turmeric for post-partum uterine involution are supported by recent animal studies demonstrating anti-inflammatory effects on uterine tissue.²⁵

***Vitex agnus-castus* L. (Chaste Tree) – Family: Lamiaceae**

Vitex agnus-castus (VAC) is the most thoroughly investigated herbal remedy for PMS, PMDD (premenstrual dysphoric disorder), and menstrual irregularities. The fruit extract contains iridoids (agnuside, aucubin), flavonoids (casticin, apigenin), and diterpenoids that collectively exert dopaminergic and mild estrogenic effects. The primary mechanism involves dopamine D2 receptor agonism in the anterior pituitary, suppressing prolactin secretion—hyperprolactinemia being a key driver of luteal phase defects and PMS symptoms.²⁶ A Cochrane-quality systematic review by He²⁷ analyzed three placebo-controlled trials and concluded that VAC extract (ZE 440 and BNO 1095 standardized preparations) was superior to placebo for PMS symptom relief. European Medicines Agency (EMA) has granted ‘well-established use’ status to VAC preparations for PMS management based on clinical evidence.²⁸

Additional Key Plants: Brief Profiles

Chamomile (*Matricaria chamomilla*): Apigenin-rich extracts demonstrate anti-inflammatory and antispasmodic effects relevant to dysmenorrhea. Dietary supplementation with chamomile extract for 4 weeks significantly reduced serum levels of malondialdehyde, a marker of oxidative stress, while alleviating premenstrual symptoms in Iranian university students.²⁹ Tea Tree Oil (*Melaleuca alternifolia*): The terpinen-4-ol constituent provides potent broad-spectrum antimicrobial activity. In vitro studies confirm strong activity against *C. albicans*, with Minimum Inhibitory Concentrations (MICs) comparable to fluconazole.³⁰ A clinical trial demonstrated 28% complete mycological cure rate with 0.1% tea tree oil vaginal cream.³¹ Black Cohosh (*Actaea racemosa*): Triterpene glycosides (actein, 27-deoxyactein) modulate serotonin and dopamine receptors, offering estrogen-independent relief of menopausal hot flashes. A meta-analysis of 16 trials concluded that black cohosh extract reduced hot flash frequency and severity significantly compared to placebo.³² Cranberry (*Vaccinium macrocarpon*): Proanthocyanidins (PACs), specifically A-type condensed tannins, prevent adhesion of uropathogenic *E. coli* to uroepithelial cells through anti-adhesion mechanisms. A meta-analysis of 13 randomized trials³³ confirmed moderate efficacy of cranberry products in reducing UTI recurrence in women, with risk reduction of approximately 35%.

Table 2 Evidence levels: A = Strong (RCT/Meta-analysis); B = Moderate (Clinical trials); C = Limited (in vitro/in vivo/preliminary clinical). VVC = vulvovaginal candidiasis; BV = bacterial vaginosis; PCOS = polycystic ovary syndrome; PMS = premenstrual syndrome; UTI = urinary tract infection.

Table 2 Phytochemical Profiles, Mechanisms of Action, and Clinical Evidence for Key Herbal Plants in Women's Health

Plant (common name)	Family	Bioactive constituents	Mechanism of action	Therapeutic indication	Evidence level*	Key references
Aloe vera	Asphodelaceae	Acemannan, aloin, barbaloin, vitamins C/E	Antimicrobial, anti-inflammatory, wound-healing	VVC, BV, vulvar healing, hygiene	B (Clinical trial)	Radha & Laxmipriya, ¹³ Nejatizadeh-Barandozi ¹⁴
Azadirachta indica (Neem)	Meliaceae	Azadirachtin, nimbin, gedunin, quercetin	Antimicrobial, spermicidal, anti-protozoal	BV, VVC, Trichomonas infection	B (Clinical trial)	Subapriya & Nagini ¹⁷ , Misra ¹⁸

Table 2 Continued...

Plant (common name)	Family	Bioactive constituents	Mechanism of action	Therapeutic indication	Evidence level*	Key references
Zingiber officinale (Ginger)	Zingiberaceae	Gingerols, shogaols, paradols, zingerone	COX-1/2 inhibition, prostaglandin reduction	Dysmenorrhea, pregnancy nausea	A (RCT + Meta-analysis)	Kiuchi et al. ²⁰ Ozgoli et al. ⁴³
Curcuma longa (Turmeric)	Zingiberaceae	Curcumin, bisdemethoxycurcumin, turmerone	NF-κB inhibition, phytoestrogenic, antioxidant	PCOS, vaginal infections, inflammation	B (Clinical trial)	Hewlings & Kalman et al. ^{23,24} Heshmati et al.
Vitex agnus-castus (Chaste Tree)	Lamiaceae	Casticin, apigenin, agnuside, aucubin	Dopamine D2 agonism; prolactin inhibition	PMS, PMDD, luteal phase defect	A (RCT + Systematic Review)	Berger et al., He et al. ^{26,27}
Matricaria chamomilla (Chamomile)	Asteraceae	Apigenin, bisabolol, chamazulene, luteolin	Antispasmodic, anti-inflammatory, anxiolytic	Dysmenorrhea, PMS, vaginal irritation	B (Clinical trial)	Sharifi et al. ²⁹
Melaleuca alternifolia (Tea Tree)	Myrtaceae	Terpinen-4-ol, γ-terpinene, α-terpineol	Membrane disruption; anti-candidal, antibacterial	VVC, BV, vulvar hygiene	C (Limited clinical)	Mondello, Casswell & Doig et al. ^{30,31}
Actaea racemosa (Black Cohosh)	Ranunculaceae	Actein, 27-deoxyactein, cimicifugic acids	Serotonin/ dopamine modulation; SERM-like activity	Menopausal symptoms, hot flashes	A (Meta-analysis)	Shams et al. ³²
Vaccinium macrocarpon (Cranberry)	Ericaceae	A-type proanthocyanidins, benzoic acid	Anti-adhesion of E. coli to uroepithelium	UTI prevention, recurrent UTIs	A (Meta-analysis)	Jepson & Craig et al. ³³
Glycyrrhiza glabra (Licorice)	Fabaceae	Glycyrrhizin, glabridin, isoliquiritigenin	Phytoestrogenic, adrenal tonic, anti-androgenic	PCOS, menopausal symptoms	B (Clinical trial)	van Gelderen et al. ³⁹

Herbal Preparation Methods and Formulations for Women's Use

The therapeutic efficacy and safety of herbal remedies depend critically on preparation methods, dosage forms, standardization, and route of administration. For women's health applications, several distinct formulation approaches have been employed, as summarized in Table 3. Vaginal preparations including gels, creams, suppositories, and wash solutions allow direct topical application to affected tissues, maximizing local drug concentration while minimizing systemic absorption and associated side effects. However, vehicle composition, pH, osmolarity, and surfactant content must be carefully optimized

to avoid disrupting the vaginal microbiome.³⁴ Oral preparations including capsules, tablets, decoctions, and tinctures are appropriate for systemic conditions including dysmenorrhea, PCOS, menopausal symptoms, and UTI prophylaxis. Standardization to marker compounds (e.g., VAC extract standardized to casticin content; ginger extract standardized to gingerol content) is essential for ensuring consistent pharmacological activity and enabling meaningful clinical comparisons.³⁵

Table 3 Overview of herbal preparation types for women's health applications with key formulation considerations. VAC = *Vitex agnus-castus*.^{34,35}

Table 3 Herbal Preparation Types, Applications, and Standardization Parameters

Preparation type	Route	Plant Examples	Indication	Key consideration	Key references
Vaginal gel/cream	Topical / vaginal	Aloe vera, Neem, Tea Tree Oil, Calendula	VVC, BV, vulvar hygiene	pH 3.8–4.5; osmolarity <380 mOsm/kg	Srinivasan, Okon et al. ^{34,15}
Vaginal suppository	Intravaginal	Garlic, Boric acid + herbs, Aloe	VVC, BV	Melting point control critical	Blumenthal et al. ³⁵
Sitz bath / wash	External topical	Calendula, Chamomile, Neem, Turmeric	Perineal healing, vulvar hygiene	Dilution and sterility essential	Shahrahmani et al. ¹⁶
Oral capsule / tablet	Oral systemic	Ginger, Turmeric, VAC, Black Cohosh	Dysmenorrhea, PMS, PCOS, menopause	Standardization to active marker	Blumenthal et al. ³⁵
Decoction / infusion (tea)	Oral	Chamomile, Ginger, Dandelion, Raspberry leaf	Menstrual cramps, UTI, edema	Bioavailability variability	Blumenthal et al. ³⁵
Tincture / extract	Oral / sublingual	VAC, Black Cohosh, Evening Primrose	PMS, menopause, PCOS	Alcohol content; drug interactions	Blumenthal et al. ³⁵
Essential oil (diluted)	Topical (diluted)	Tea Tree, Lavender, Clary Sage	Topical antimicrobial, perineal care	Must be diluted; pure oil caustic	Mondello et al. ³⁰

Pharmacological mechanisms of key bioactive compounds

Figure 1 schematically illustrates the primary pharmacological pathways through which herbal bioactive compounds exert their effects in women's health conditions. The main mechanistic categories are described below.

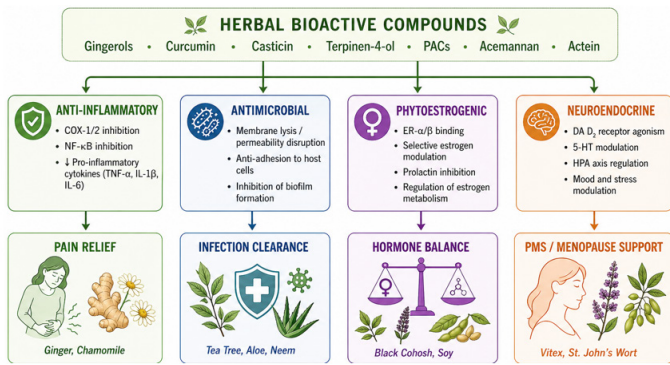


Figure 1 schematically illustrates the primary pharmacological pathways through which herbal bioactive compounds exert their effects in women's health conditions.

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Figure 1. Schematic representation of primary pharmacological mechanisms through which herbal bioactive compounds address

women's health conditions. COX = cyclooxygenase; NF-κB = nuclear factor kappa B; ER = estrogen receptor; DA = dopamine; 5-HT = serotonin. Compiled from Kiuchi, Hewlings & Kalman, Berger, Shams.^{20,23,26,32}

Anti-inflammatory mechanisms represent the most prevalent mode of action, relevant to dysmenorrhea, vulvar inflammation, and pelvic pain. Gingerols and shogaols in ginger inhibit both COX-1 and COX-2 enzymes, reducing prostaglandin E2 and thromboxane B2 synthesis—the primary mediators of uterine cramping.²⁰ Curcumin additionally targets the NF-κB pathway, suppressing transcription of pro-inflammatory cytokines including TNF-α, IL-1β, and IL-6.²³ Antimicrobial mechanisms involve diverse molecular targets including bacterial membrane disruption (terpinen-4-ol in tea tree oil), inhibition of biofilm formation (curcumin, garlic allicin), anti-adhesion effects (cranberry PACs), and direct fungicidal activity (neem nimbidin, garlic allicin). These mechanisms offer advantages over conventional antibiotics by targeting multiple pathways simultaneously, potentially reducing resistance development.³⁶ Phytoestrogenic activity, exhibited by isoflavones (soy, red clover), lignans (flaxseed), and coumestans, involves selective binding to estrogen receptors α and β with tissue-specific agonist or antagonist effects, modulating the endocrine disruption associated with menopause and PCOS. The selective estrogen receptor modulator (SERM)-like profile of black cohosh compounds may explain both hot flash relief and potential absence of HRT-associated risks.³²

Summary of Key Clinical Evidence

Table 4 summarizes pivotal clinical studies examining herbal interventions for women's health conditions, providing details on study design, sample size, primary outcomes, and conclusions.

Table 4 Summary of Key Clinical Trials and Meta-Analyses: Herbal Plants for Women's Health

Plant	Study Type	n	Condition	Key finding	Reference
Ginger	RCT (double-blind)	150	Primary dysmenorrhea	Ginger 250 mg QID ≡ ibuprofen 400 mg for pain reduction (p > 0.05)	Ozgoli et al. ⁴³
Vitex agnus-castus	Systematic review (3 RCTs)	517	PMS / PMDD	VAC superior to placebo for global PMS symptom relief across all trials	He et al. ²⁷
Black Cohosh	Meta-analysis (16 RCTs)	2,027	Menopausal symptoms	Significant reduction in hot flash frequency and severity vs. placebo (SMD -0.57)	Shams et al. ³²
Cranberry	Meta-analysis (13 RCTs)	1,616	Recurrent UTI prevention	~35% risk reduction of rUTIs in women; NNT = 8	Jepson & Craig et al. ³³
Aloe vera (vaginal cream)	RCT vs. clotrimazole	60	VVC (vaginal candidiasis)	Comparable mycological cure (73% vs. 80%; p = 0.48) with fewer side effects	Okon et al. ¹⁵
Ginger	Meta-analysis (6 RCTs)	508	Nausea of pregnancy	Significant reduction in NVP severity; no teratogenic signals	Viljoen et al. ²¹
Curcumin	RCT	67	PCOS metabolic parameters	Significant reduction in testosterone, insulin resistance, and BMI (p < 0.05)	Heshmati et al. ²⁴
Chamomile	RCT	80	PMS / dysmenorrhea	Significant reduction in PMS symptoms and oxidative stress markers vs. placebo	Sharifi et al. ²⁹

Summary of key clinical studies on herbal interventions for women's health. RCT = randomized controlled trial; PMS = premenstrual syndrome; VVC = vulvovaginal candidiasis; UTI = urinary tract infection; NNT = number needed to treat; SMD = standardized mean difference.

Safety considerations, drug interactions, and contraindications

While herbal remedies are widely perceived as safe by the general public, significant safety considerations exist, particularly in the context of pregnancy, lactation, polypharmacy, and long-term use. Table 5 summarizes key safety data for the discussed herbs. Pregnancy safety is a paramount concern. Certain herbs with uterotonic or emmenagogic properties—including large doses of ginger, blue cohosh (*Caulophyllum thalictroides*), pennyroyal, and aloe latex—are contraindicated during pregnancy or carry significant risk warnings.³⁷ Neem oil is explicitly contraindicated in pregnancy due to documented abortifacient effects.¹⁸ In contrast, culinary doses of ginger and chamomile are generally considered safe for pregnancy-

related nausea. Drug interactions represent a clinically important safety dimension. St. John's Wort (*Hypericum perforatum*), though not primarily a gynecological herb, significantly induces CYP3A4 enzymes, reducing plasma concentrations of oral contraceptives, potentially resulting in unintended pregnancy.³⁸ Licorice root at high doses can cause pseudohyperaldosteronism and may interact with diuretics, antihypertensives, and corticosteroids.³⁹ Ginger at high doses (>4 g/day) may potentiate anticoagulants including warfarin, aspirin, and clopidogrel.⁴⁰ Liver toxicity has been reported with several herbal preparations. Black cohosh has been implicated in rare cases of hepatotoxicity, with the WHO Vigibase documenting approximately 30 spontaneous reports globally, though causality remains contested.⁴¹ Quality control, standardization, and absence of adulterants are critical determinants of herbal product safety.

Table 5 Safety Profile, Contraindications, and Drug Interactions of Key Herbal Plants

Plant	Pregnancy safety	Known drug interactions	Contraindications	Hepatotoxicity risk	Key references
Aloe vera (oral)	CONTRAINDICATED (latex)	Warfarin, diuretics, cardiac glycosides	IBD, hemorrhoids, renal disease	Low risk (topical); avoid oral latex	Borrelli & Ernst et al. ²²
Neem oil	CONTRAINDICATED	Immunosuppressants, hypoglycemics	Pregnancy; infants (toxicity risk)	Low	Misra et al. ¹⁸
Ginger	Safe (culinary doses)	Warfarin, antiplatelet agents (>4 g/day)	Gallstones; pre-surgical (high dose)	Very low	Vaes & Chyka, Borrelli et al. ^{40,22}
Turmeric/ Curcumin	Safe (culinary); caution supplements	Warfarin; may reduce iron absorption	Biliary obstruction; gallstones	Very low	Vaes & Chyka ⁴⁰
Vitex agnus-castus	AVOID (dopaminergic effects)	Dopamine antagonists (antipsychotics, metoclopramide)	Pregnancy; hormone-sensitive conditions	Very rare cases reported	Hall et al, EMA ^{38,44}
Black Cohosh	AVOID	Hepatotoxic drugs; tamoxifen	Liver disease; hormone-sensitive cancers	Rare; monitor LFTs in long-term use	Teschke et al. ⁴¹
Cranberry	Likely safe	Warfarin (possible interaction)	Oxalate kidney stones (high dose)	Very low	Jepson & Craig ³³
Tea Tree Oil	Topical only; avoid oral	None significant (topical)	Never use undiluted; toxic if ingested	Low (topical)	Mondello et al. ³⁰

Table 5. Safety profiles of key herbal plants for women's health. Color coding: Red = Contraindicated; Orange = Caution; Green = Generally safe. LFTs = liver function tests. Compiled from Borrelli & Ernst, Hall, Teschke.^{37,38,41}

Discussion

Heterogeneity and quality of the evidence base

This review compiles a substantial body of evidence supporting the role of herbal plants in addressing common women's health and hygiene challenges. Several overarching observations emerge from this analysis: first, the evidence base is heterogeneous. While some herbal remedies have been subjected to rigorous randomized controlled trials and systematic reviews (e.g., ginger for dysmenorrhea, VAC for PMS, black cohosh for menopausal symptoms, cranberry for UTI prevention), many others rely predominantly on in vitro studies, animal models, and observational data. This limitation underscores the need for standardized, adequately powered clinical trials employing validated outcome measures.

Multi-target pharmacology as a therapeutic advantage

The multi-target pharmacology represents a distinctive advantage of herbal remedies over single-molecule pharmaceuticals. For

example, ginger simultaneously addresses pain, nausea, and inflammation through multiple molecular pathways, which may explain its broad clinical utility across multiple women's health conditions. This polypharmacological approach may be particularly advantageous for complex conditions such as PCOS and menopausal syndrome, where multiple symptom domains require simultaneous management.⁴² Notably, the magnitude of benefit reported for the best-studied agents is clinically meaningful and compares favorably with first-line pharmacological options: ginger produced pain relief comparable to standard-dose ibuprofen and mefenamic acid in primary dysmenorrhea,⁴³ Vitex agnus-castus was superior to placebo for global PMS symptom relief across three controlled trials,²⁷ black cohosh significantly reduced hot flash frequency and severity across sixteen pooled trials,³² and cranberry reduced recurrent UTI risk by approximately 35%.³³ Taken together, these findings strengthen the scientific case for prioritizing further investment in rigorous herbal medicine research.

Safety, regulation, and quality control gaps

Moreover, safety remains an under-studied dimension. The widespread cultural perception of herbal remedies as inherently safe is not supported by evidence. Drug interactions, contamination with heavy metals or adulterants, dose-dependent toxicities, and pregnancy-

specific risks require urgent attention. Regulatory frameworks in most countries lack robust mechanisms to ensure quality, safety, and efficacy of herbal products, creating significant risks for consumers.⁴⁴

Cultural competence and patient-provider communication

Cultural competence in healthcare delivery requires acknowledging the preferences of women who use herbal remedies, often without disclosing this to their healthcare providers. Studies suggest that 40–70% of users of complementary medicine do not report this to their physicians.⁴⁵ This communication gap creates risks for drug interactions and inappropriate delay of necessary conventional treatment.

Conclusions and future directions

Herbal plants represent a valuable and evidence-supported component of women's healthcare, particularly for menstrual disorders, vaginal hygiene, menopausal symptoms, and urinary tract infection prevention. Plants including ginger, *Vitex agnus-castus*, black cohosh, cranberry, aloe vera, and tea tree oil offer clinically meaningful benefits with generally favorable safety profiles when used appropriately. Future research priorities should include large-scale, multicenter randomized controlled trials with standardized preparations and validated outcome measures. Pharmacovigilance systems must be developed dedicated to herbal medicine adverse events in women with development and implementation of internationally harmonized quality standards for botanical products. Investigation of synergistic combinations and optimal delivery systems for vaginal applications; and exploration of microbiome-modulating effects of herbal preparations on the vaginal ecosystem. Integration of evidence-based herbal medicine into mainstream women's healthcare—alongside conventional therapy—holds significant promise for improving healthcare access, reducing adverse drug effects, and honoring cultural healing traditions, particularly in resource-limited settings where a substantial proportion of the world's women live.

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None

Conflicts of interests

The authors declare no conflicts of interest.

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