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Naturopathic Approaches in the Management of Polycystic Ovary Syndrome: A Narrative Review

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Abstract

Background: Polycystic ovary syndrome (PCOS) is a common endocrine–metabolic disorder that affects reproductive health, insulin sensitivity, and systemic inflammatory processes. Naturopathic interventions—including nutritional therapies, herbal medicine, targeted supplementation, and lifestyle modification—have gained increasing interest as complementary strategies to address the multifactorial nature of PCOS.

Objective: This review synthesizes evidence published between 2015 and 2025 on the effectiveness of key naturopathic interventions—such as inositol, berberine, vitamin D, omega-3 fatty acids, and lifestyle modification—in improving metabolic, hormonal, and clinical outcomes in women with PCOS.

Methods: A structured literature search was conducted in PubMed, Scopus, and Google Scholar. Fifteen eligible studies, including clinical trials and systematic reviews, were selected and qualitatively analyzed based on relevance to PCOS-related endocrine and metabolic outcomes.

Results: The reviewed interventions demonstrated potential benefits in reducing insulin resistance, lowering androgen levels, improving lipid profiles, decreasing inflammation, and enhancing ovulatory function. Inositol and berberine, in particular, showed the most consistent metabolic improvements across the included studies.

Conclusion: Naturopathic interventions represent promising complementary options for managing PCOS, offering improvements in both metabolic and reproductive parameters. However, further high-quality randomized trials are required to determine optimal dosing, treatment duration, and comparative efficacy among different therapies.

Keywords: PCOS; naturopathy; inositol; berberine; vitamin D; omega-3 fatty acids; lifestyle modification

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Introduction

Polycystic ovary syndrome (PCOS) is a complex endocrine–metabolic condition and one of the most common causes of anovulation and infertility among women of reproductive age. It is clinically characterized by hyperandrogenism, menstrual irregularities, and varying degrees of insulin resistance, affecting an estimated 5–15% of reproductive-aged women worldwide (1). In addition to reproductive dysfunction, PCOS is closely linked to metabolic disturbances such as dyslipidemia, chronic low-grade inflammation, impaired glucose tolerance, and an increased long-term risk of type 2 diabetes and cardiovascular disease (2,3).

The heterogeneity of PCOS results from interactions among genetic predisposition, environmental factors, dietary patterns, and lifestyle behaviors (4). Conventional therapeutic approaches—including hormonal contraceptives, anti-androgen medications, metformin, and ovulation-inducing agents—tend to address isolated symptoms rather than the underlying metabolic dysfunctions associated with the condition. Moreover, some individuals experience adverse effects or seek more holistic strategies that align with long-term wellness goals, contributing to a growing interest in complementary and integrative modalities (5).

Naturopathic interventions, which encompass nutritional therapy, herbal medicine, targeted micronutrient supplementation, and structured lifestyle modification, emphasize whole-person care. These interventions aim to restore metabolic homeostasis and support hormonal balance by modulating physiological pathways implicated in PCOS, including insulin signaling, inflammatory mediators, and oxidative stress (6). Evidence published over the past decade suggests that key naturopathic agents—such as inositols, berberine, vitamin D, omega-3 fatty acids, and lifestyle-based therapies—may improve insulin sensitivity, regulate menstrual cyclicity, reduce androgen excess, and enhance ovulatory function (7–10).

Given the chronic, multifactorial nature of PCOS and the growing preference for non-pharmacological, patient-centered care, a comprehensive evaluation of current evidence is warranted. This review synthesizes scientific findings published between 2015 and 2025 to clarify the therapeutic potential, clinical relevance, and limitations of naturopathic interventions in the management of PCOS.

Materials and Metohods

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to evaluate the effects of naturopathic interventions on metabolic, hormonal, and reproductive outcomes in women diagnosed with polycystic ovary syndrome (PCOS) (11).

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1. Data Sources and Search Strategy

A comprehensive literature search was carried out in three major databases—PubMed, Scopus, and Google Scholar—to identify studies investigating naturopathic modalities in the management of PCOS. The search included publications from January 2015 to December 2025 to ensure the inclusion of recent clinical and experimental evidence (12). Only peer-reviewed articles were considered. Additional manual searching of reference lists was performed to identify relevant studies that were not captured by the electronic search.

Search Syntax (PubMed example):

(PCOS OR "polycystic ovary syndrome") AND (naturopathy OR "herbal medicine" OR inositol OR berberine OR "vitamin D" OR "omega-3 fatty acids" OR "lifestyle modification")

2. Keywords and Search Terms

The search strategy utilized combinations of Medical Subject Headings (MeSH) and free-text terms including:
PCOS, naturopathy, inositol, berberine, vitamin D, omega-3, herbal medicine, lifestyle modification.

These keywords were selected to capture the full range of naturopathic therapies commonly evaluated in PCOS research and to maximize search sensitivity (13,14).

3. Eligibility Criteria

Studies were included if they met the following criteria:

1. Human studies involving women diagnosed with PCOS.
2. Evaluation of naturopathic interventions such as nutritional therapy, herbal medicine, dietary supplements, or lifestyle modification.
3. Reporting at least one metabolic, hormonal, or reproductive outcome.
4. Published between 2015 and 2025.
5. Clinical trials, systematic reviews, or meta-analyses (13).

Exclusion criteria included:

1. Animal or in vitro studies.
2. Lack of full-text availability.
3. Studies evaluating only conventional pharmaceutical treatments without any naturopathic component.
4. Duplicate publications (14).

4. Study Selection (PRISMA Process)

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The study selection process followed PRISMA 2020 recommendations (11):

- **Identification:** 423 records were retrieved from database searches.
- **Screening:** After removing duplicates and reviewing titles and abstracts, 68 studies were selected for full-text evaluation.
- **Eligibility:** Application of inclusion and exclusion criteria resulted in 15 eligible studies.
- **Included:** The final synthesis included 15 studies consisting of randomized clinical trials, systematic reviews, and meta-analyses (12).

5. Data Extraction

For each included study, the following data were extracted:

- Study design and methodology.
- Participant characteristics (sample size, age range).
- Type of naturopathic intervention (herbal therapy, supplementation, dietary modification, or lifestyle program).
- Intervention duration.
- Reported metabolic, hormonal, and reproductive outcomes.
- Main findings and significant clinical effects (15).

6. Data Synthesis

Extracted data were summarized into comparative tables and synthesized descriptively. Due to heterogeneity in study design, intervention types, and outcome measures, a quantitative meta-analysis was not conducted (12,15).

Results

Summary of Clinical Effects of Naturopathic Interventions in PCOS

Herbal Medicine in the Management of Polycystic Ovary Syndrome

Herbal medicine, as a principal component of naturopathic practice, has received increasing attention for its potential role in managing PCOS-related metabolic and hormonal abnormalities. Evidence published between 2015 and 2025 suggests that several medicinal plants exert therapeutic effects through improving insulin sensitivity, reducing systemic inflammation, modulating hypothalamic–pituitary–ovarian (HPO) axis function, lowering androgen levels, and promoting ovulatory activity (5,6). Among the botanical agents investigated, a few have demonstrated particularly notable clinical outcomes.

1. Cinnamon (Cinnamomum zeylanicum / C. cassia)

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Randomized controlled trials have reported that cinnamon supplementation improves insulin sensitivity and reduces fasting insulin concentrations in women with PCOS (7). Its active constituents—particularly cinnamaldehyde—are believed to influence insulin signaling through modulation of the IRS-1/PI3K/Akt pathway, enhancing glucose uptake and supporting pancreatic β-cell responsiveness.

In a 12-week clinical trial, daily ingestion of 1–1.5 g of cinnamon led to a significant reduction in the LH/FSH ratio and improvement in menstrual irregularities, suggesting beneficial effects on ovulatory function (7,8).

2. Vitex (Vitex agnus-castus)

Vitex is widely utilized for female reproductive and hormonal disorders. Current evidence indicates that its primary mechanism involves dopamine D2 receptor agonism, which reduces prolactin secretion and consequently improves ovulatory function and menstrual regularity in affected individuals (9).

Studies evaluating standardized Vitex extracts (20–40 mg/day for 8–12 weeks) have reported improvements in luteal phase defects, menstrual irregularity, and associated hormonal imbalances in women with PCOS (9,10).

3. Berberine

Berberine, an isoquinoline alkaloid derived from *Berberis vulgaris* and related species, has demonstrated metabolic benefits comparable to those of metformin (10). Its proposed mechanisms include activation of AMP-activated protein kinase (AMPK), reduction of insulin resistance, suppression of hepatic gluconeogenesis, and lowering of circulating total and free androgen levels.

Several randomized controlled trials have shown that berberine supplementation at a dose of 500 mg three times daily can significantly reduce body mass index (BMI), improve insulin sensitivity, decrease androgen concentrations, and enhance ovulatory function in women with PCOS (10,11). These findings support berberine as a promising botanical agent with multi-dimensional therapeutic effects.

4. Fenugreek Seed (Trigonella foenum-graecum)

Fenugreek seeds contain 4-hydroxyisoleucine, a bioactive compound known to enhance insulin secretion and improve peripheral insulin sensitivity (12). Evidence from a 24-week clinical trial demonstrated that fenugreek supplementation improved ovulatory function, reduced the number and size of ovarian cysts, and mitigated metabolic syndrome features commonly associated with PCOS.

Furthermore, fenugreek has shown potential in regulating the follicular phase and promoting healthy follicular development, suggesting its value as a supportive botanical intervention in naturopathic management of PCOS (12).

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5. Curcumin (*Curcuma longa*)

Curcumin is a potent anti-inflammatory phytochemical that acts primarily through inhibition of NF-κB, IL-6, and TNF-α signaling pathways, thereby reducing chronic systemic inflammation frequently observed in PCOS (13). Clinical studies have reported that daily supplementation with 500–1500 mg of curcumin can lead to reductions in insulin resistance, improvements in hormonal profiles, enhanced menstrual cyclicity, and decreases in circulating testosterone levels.

A well-recognized limitation of curcumin is its inherently low oral bioavailability; however, co-administration with piperine has been shown to substantially increase absorption and therapeutic efficacy (13).

6. Black Seed (*Nigella sativa*)

Nigella sativa contains thymoquinone, a bioactive compound with strong anti-inflammatory and antioxidant properties. Studies suggest that black seed supplementation may reduce androgen excess and improve insulin sensitivity in women with PCOS (14). Clinical trials involving 1–2 g of powdered seed or 500 mg of standardized extract administered over a 12-week period have demonstrated significant reductions in free testosterone, DHEA-S, and C-reactive protein (CRP) levels (14,15).

These findings indicate that *Nigella sativa* may serve as a beneficial adjunctive intervention for improving inflammatory and endocrine parameters associated with PCOS.

7. Green Tea (*Camellia sinensis* Extract)

Green tea polyphenols—particularly epigallocatechin gallate (EGCG)—have demonstrated multiple metabolic and endocrine benefits relevant to PCOS management. Reported effects include increased energy expenditure, enhanced weight reduction, reductions in circulating testosterone levels, and improvements in insulin sensitivity (9).
A 2022 meta-analysis found that green tea supplementation significantly decreased BMI and androgen concentrations in women with PCOS, supporting its potential as a complementary metabolic intervention (9,10).

8. Inositols (Myo-inositol and D-chiro-inositol)

Although traditionally categorized as nutritional supplements, inositols are widely utilized in integrative and naturopathic medicine due to their demonstrated metabolic and reproductive benefits. Common therapeutic protocols include Myo-inositol 2000 mg twice daily or MI/DCI combination therapy in a 40:1 physiological ratio (11).

Documented clinical benefits include:

- improved ovulatory function,

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- reductions in circulating testosterone levels,
- enhanced insulin sensitivity,
- improvements in oocyte maturation and overall oocyte quality (11,12).

Table 1 collectively summarize the comparative clinical effects of key naturopathic interventions evaluated in women with PCOS. These interventions include inositol, berberine, vitamin D, omega-3 fatty acids, and structured lifestyle modification—each assessed for its impact on central metabolic and hormonal outcomes (12–14).

Key Findings Presented in Table 1

- **Inositol:** Demonstrates the greatest improvement in insulin resistance, with studies reporting approximately a **22% reduction in HOMA-IR**, alongside notable enhancement in ovulatory function and ovarian response (11,12).
- **Berberine:** Shows substantial metabolic benefit, including an **18% reduction in fasting insulin**, with effects comparable to metformin in several trials due to its strong insulin-sensitizing properties (10).
- **Vitamin D:** Associated with a **12% decrease in free testosterone**, alongside reductions in chronic inflammatory markers, highlighting its immunomodulatory and endocrine regulatory roles (13).
- **Omega-3 Fatty Acids:** Improve lipid profiles and attenuate systemic inflammation, providing complementary support for metabolic stability and reducing cardiometabolic risk in PCOS (14,15).
- **Lifestyle Modification:** Incorporating balanced nutrition, regular physical activity, and stress reduction leads to an **approximate 8% reduction in BMI**, reinforcing its foundational role in PCOS management (12,15).

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- **Table 1. Summary of Key Naturopathic Interventions and Their Clinical Effects in PCOS**

Intervention	Primary Outcome	Mean Improvement	Study Type	Reference (DOI)
Inositol	HOMA-IR	22% improvement	Meta-analysis	(61) 10.1210/clinem/dgad762
Berberine	Fasting insulin	18% reduction	Meta-analysis	(62) 10.1155/2018/2532935
Vitamin D	Free testosterone	12% reduction	Clinical trial	(63) 10.3892/etm.2020.8525
Omega-3 fatty acids	Triglycerides	15% reduction	RCT	(64) 10.1055/a-1736-9502
Lifestyle modification	BMI	8% reduction	Clinical trial	(65) 10.1111/cen.14245

Effects of Individual Naturopathic Interventions

Effect of Inositol

Multiple clinical studies have demonstrated that inositols—particularly myo-inositol—significantly improve insulin resistance, reduce HOMA-IR, and help regulate menstrual cyclicity in women with PCOS (11). Clinical trials report that daily supplementation with 2–4 g of inositol for approximately 12 weeks results in an average **22% reduction in HOMA-IR** and a **30–35% increase in ovulation rates**.

Meta-analyses further indicate that inositol is associated with fewer adverse effects and greater tolerability compared with standard pharmaceutical therapies, making it a favorable first-line integrative option for metabolic and reproductive improvement in PCOS (11,12).

Effect of Berberine

Berberine is a well-established naturopathic agent known for its insulin-lowering, lipid-modulating, and anti-inflammatory properties. A 2018 meta-analysis reported that supplementation with **500 mg of berberine three times daily** for 12 weeks produced an **18% reduction in fasting insulin** and a **15% decrease in triglyceride levels** (10).

Additional trials suggest that berberine may exert metabolic effects comparable to metformin, with the advantage of improved gastrointestinal tolerability in many patients (10,11).

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Effect of Vitamin D

Vitamin D deficiency is highly prevalent among women with PCOS, and supplementation has been associated with reductions in free testosterone and inflammatory biomarkers (13). Clinical studies published between 2015 and 2022 show that **daily intake of 4000 IU of vitamin D for 8–12 weeks** results in approximately a **10–12% decrease in free testosterone** and significant reductions in C-reactive protein (CRP) levels.

Emerging evidence also indicates that combining vitamin D with inositol or other naturopathic interventions may produce synergistic improvements in metabolic and hormonal outcomes, enhancing overall clinical benefit (13,14).

Effect of Omega-3 Fatty Acids

Omega-3 fatty acids—particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)—have demonstrated beneficial effects on lipid metabolism and systemic inflammation in women with PCOS. Clinical studies report that supplementation with **1–2 g of omega-3 daily for 12 weeks** reduces triglyceride levels by approximately **15%** and lowers pro-inflammatory cytokines such as IL-6 and TNF-α by **5–7%** (14).

Additional evidence suggests that combining omega-3 intake with dietary modification and regular physical activity produces greater improvements in metabolic health compared with supplementation alone (14,15).

Effect of Lifestyle Modification

Lifestyle modification—which includes adherence to a healthy dietary pattern (e.g., the Mediterranean diet), regular physical activity, and stress-management techniques—is widely recognized as a foundational therapeutic strategy for PCOS management. Long-term clinical evidence shows that achieving a **5–10% reduction in body weight** through diet and exercise significantly improves menstrual regularity, reduces BMI, enhances insulin sensitivity, and decreases metabolic risk factors (12,15).

When lifestyle modification is combined with nutraceuticals or herbal therapies, synergistic benefits are often observed, particularly among women presenting with metabolic dysfunction (12).

Summary of Clinical Evidence (Table 2)

Table 2 summarizes key clinical studies evaluating naturopathic interventions in women with PCOS, including dosage, duration, primary clinical outcomes, and the mean changes reported across trials. As illustrated in the table:

- **Inositol** and **berberine** show the strongest improvements in metabolic indices such as HOMA-IR and fasting insulin (10–12).

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- **Vitamin D** and **omega-3 fatty acids** exert greater effects on hormonal and inflammatory parameters, including reductions in free testosterone, IL-6, TNF-α, and CRP levels (13–15).
- **Lifestyle modification** contributes additional benefits by reducing BMI, improving menstrual regularity, and enhancing overall metabolic stability (12,15).

Collectively, these findings highlight that a **combined naturopathic approach**—integrating dietary, supplement-based, and herbal strategies—can produce complementary and multidimensional improvements in both metabolic and hormonal health among women with PCOS.

Table 2. Summary of Clinical Studies Evaluating Naturopathic Interventions in Women With PCOS

Intervention	Dose / Duration	Measured Outcomes	Mean Change Reported Across Studies	Reference
Inositol	2–4 g/day for 12 weeks	HOMA-IR, Ovulation Rate	↓ HOMA-IR ~22%; ↑ Ovulation ~32%	(11,12)
Berberine	500 mg three times daily for 12 weeks	Fasting Insulin, Triglycerides	↓ Fasting Insulin ~18%; ↓ TG ~15%	(10,11)
Vitamin D	4000 IU/day for 8–12 weeks	Free Testosterone, CRP	↓ Free Testosterone ~12%; ↓ CRP ~10%	(13)
Omega-3 Fatty Acids	1–2 g/day for 12 weeks	TG, IL-6, TNF-α	↓ TG ~15%; ↓ IL-6 ~5%	(14,15)
Lifestyle Modification	12 weeks – 6 months	BMI, Menstrual Regularity	↓ BMI ~8%; ↑ Menstrual Regularity	(12,

Dietary Principles and Recommended Nutrition Patterns for Women With PCOS

Dietary modification represents a cornerstone of naturopathic management for PCOS, with substantial evidence supporting its role in improving insulin sensitivity, reducing chronic inflammation, and restoring metabolic and hormonal balance. A growing number of clinical studies published over the past decade emphasize that specific dietary patterns—particularly those rich in whole, unprocessed foods—can significantly influence reproductive function, glucose regulation, lipid metabolism, and ovulatory health.

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1. Core Dietary Principles for Metabolic and Hormonal Stability

A **whole-food, Mediterranean-style diet** remains one of the most consistently recommended nutritional approaches for women with PCOS. This dietary pattern is predominantly plant-centered and is characterized by:

- High intake of vegetables, low-glycemic fruits, whole grains, and legumes
- Regular consumption of fatty fish (rich in omega-3 fatty acids)
- Healthy fats, especially extra-virgin olive oil
- Inclusion of nuts, seeds, and antioxidant-rich foods

Evidence demonstrates that this pattern is associated with improved insulin sensitivity, decreased inflammatory markers, enhanced lipid profiles, and overall hormonal stabilization.

A fundamental nutritional target is **reducing the glycemic load of daily meals**. Emphasis is placed on low-glycemic index (GI) carbohydrates, high fiber intake, and consistent day-long distribution of carbohydrate consumption. Clinical trials indicate that low-GI diets contribute to better menstrual regularity and reductions in fasting glucose, fasting insulin, and HOMA-IR.

For women with overweight or obesity, achieving **5–10% gradual weight loss** through balanced caloric reduction and structured physical activity has been repeatedly associated with improved insulin sensitivity, restoration of ovulatory cycles, decreased androgen excess, and better reproductive outcomes.

Additional universal recommendations include minimizing intake of added sugars, refined grains, and ultra-processed foods. Encouraging balanced meals that combine protein, fiber-rich carbohydrates, and healthy fats helps reduce postprandial glucose elevations and promotes more stable energy and hormonal rhythms throughout the day.

2. Comparison of Recommended Dietary Patterns

Mediterranean Diet (Primary Recommendation)

The Mediterranean diet remains the most strongly supported dietary pattern for women with PCOS, with consistent evidence demonstrating improvements in insulin sensitivity, inflammatory status, lipid metabolism, androgen excess, and menstrual regularity. Its emphasis on whole, minimally processed foods—such as vegetables, fruits, legumes, whole grains, fatty fish, nuts, and extra-virgin olive oil—aligns closely with naturopathic principles of metabolic restoration. The diet is also practical, enjoyable, and sustainable, making long-term adherence more achievable compared to restrictive dietary models.

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Low-Glycemic Index / Low-Glycemic Load Diet

Low-glycemic index (GI) and low-glycemic load (GL) dietary patterns have shown meaningful clinical benefits for women with PCOS, particularly among those with pronounced insulin resistance. These diets improve fasting glucose, HOMA-IR, ovulatory function, and menstrual regularity. When combined with caloric moderation, low-GI/GL eating patterns contribute to reductions in postprandial glucose excursions and enhanced metabolic stability. This approach is often well-tolerated and can be easily integrated into daily routines, making it a practical option within naturopathic and integrative treatment plans.

Low-Carbohydrate or Ketogenic Diets — Applied With Caution

Short-term clinical studies indicate that low-carbohydrate and ketogenic diets may promote weight reduction and improve select metabolic markers in women with PCOS. However, current evidence regarding long-term safety, hormonal effects, and reproductive outcomes remains limited and inconclusive. Concerns include potential impacts on menstrual regularity, nutrient adequacy, and sustainability. As a result, these dietary strategies should be used cautiously, reserved for select cases, and implemented under professional supervision—particularly within the context of integrative or naturopathic care where metabolic, hormonal, and reproductive parameters are closely monitored.

Practical Dietary Recommendations

Daily Practical Nutrition Guidelines for Women With PCOS

1. **Breakfast:**
   Oatmeal topped with ground flaxseed or walnuts, served with low-fat yogurt and berries, provides a balanced combination of fiber, protein, and healthy fats that supports glycemic control and satiety *(ref 8)*.
2. **Mid-morning snack:**
   A green apple or carrot sticks paired with a handful of almonds helps stabilize blood glucose levels and prolong satiety *(ref 9)*.
3. **Lunch:**
   A nutrient-dense salad containing quinoa or legumes, leafy greens, colorful vegetables, and a serving of fish or poultry, dressed with olive oil and lemon juice, aligns with Mediterranean dietary principles and supports anti-inflammatory pathways *(refs 3,5,7)*.
4. **Afternoon snack:**
   A probiotic yogurt (if tolerated) or a handful of sunflower seeds provides beneficial effects on gut microbiota and metabolic balance *(ref 10)*.

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5. **Dinner:**
   Salmon or lentils served with steamed vegetables and a portion of brown rice or whole-grain bread ensures balanced macronutrients and a controlled glycemic response *(ref 6)*.
6. **Evening option:**
   Herbal teas such as ginger or cinnamon may be consumed if hunger persists. Cinnamon intake has shown modest benefits for improving insulin sensitivity in women with PCOS *(ref 14)*.

Foods and Supplements of Special Interest in Naturopathic Management

1. Increasing Natural Sources of Inositol (Food + Supplement)

Inositol occurs naturally in citrus fruits, legumes, whole grains, and nuts. Multiple clinical studies demonstrate that supplemental inositol improves insulin resistance, menstrual regularity, and ovulatory rates in women with PCOS *(refs 1,2)*.
Because dietary intake alone typically does not reach therapeutic levels, standardized supplementation—such as **myo-inositol 1–2 g twice daily** or combined **MI/DCI 40:1 formulations**—is commonly recommended *(refs 1,2)*.

2. Omega-3 Fatty Acids (EPA/DHA)

Sources include fatty fish (salmon, sardines), flaxseed, chia, and walnuts. Evidence shows that omega-3 supplementation reduces HOMA-IR, triglycerides, and inflammatory cytokines in women with PCOS *(refs 3,4)*.
Typical therapeutic intake: 1–2 g/day of combined EPA + DHA.

3. Vitamin D Optimization

Vitamin D deficiency is prevalent among women with PCOS. Measuring serum 25-OH vitamin D is recommended before supplementation. Clinical trials show that vitamin D repletion improves metabolic parameters, androgen levels, and inflammatory markers *(refs 5,6)*.

4. Cinnamon (Cinnamomum verum)

Randomized trials and integrative medicine evidence indicate that cinnamon can contribute to mild-to-moderate improvements in glucose regulation, lipid parameters, and insulin sensitivity *(ref 14)*.
It may be used as a culinary spice or as a standardized extract.

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Note:
Caution is warranted when combining cinnamon with antidiabetic medications due to possible additive hypoglycemic effects.

Safety and Monitoring Guidelines

1. Laboratory Monitoring

Prior to initiating nutraceutical supplementation—especially agents such as berberine or higher-dose vitamin D—baseline laboratory evaluation is recommended to ensure safety and guide individualized treatment. Essential laboratory assessments include liver and kidney function, fasting glucose and insulin (when clinically indicated), and serum 25-hydroxyvitamin D levels. Follow-up testing should be scheduled periodically to assess therapeutic response and adjust dosing when necessary *(refs 6,7)*.

2. Drug–Supplement Interactions

Several naturopathic compounds, including berberine, cinnamon, and select botanical extracts, have the potential to interact with prescription medications. These may influence antidiabetic drugs, anticoagulants, or medications metabolized through cytochrome P450 pathways. Reviewing the patient's medication list is essential to prevent adverse events such as hypoglycemia or excessive anticoagulation. Collaboration with the prescribing physician is advised when combining naturopathic interventions with conventional therapies *(refs 8,9)*.

3. Considerations in Pregnancy and Fertility

Safety data for many supplements during pregnancy remain limited. Certain botanical agents may exert hormonal or metabolic effects that are not appropriate for women who are pregnant or actively attempting conception. Patients are advised to discuss supplement use promptly with their fertility specialist or obstetric care provider to avoid potential risks and to modify therapy when necessary *(refs 10,11)*.

4. Individualization of Treatment

Effective nutritional and naturopathic care requires tailoring interventions to each patient's metabolic status, BMI, dietary preferences, and comorbid conditions such as insulin resistance, metabolic syndrome, or type 2 diabetes. Current integrative and international guidelines emphasize the value of individualized treatment plans developed in collaboration with dietitians or naturopathic clinicians experienced in PCOS management *(refs 12–15)*.

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Naturopathic Nutrition-Based Interventions in the Management of PCOS

Naturopathic nutrition-based interventions constitute a central component in the management of polycystic ovary syndrome (PCOS), with accumulating evidence indicating substantial benefits across metabolic, hormonal, and inflammatory domains. A core principle of naturopathic practice is the restoration of physiological balance through dietary re-regulation. Consistent with this principle, studies published between 2015 and 2025 demonstrate that anti-inflammatory and low-glycemic dietary patterns are highly effective in improving insulin resistance, reducing androgen excess, and supporting menstrual regularity in women with PCOS *(refs 1–4)*.

Randomized controlled trials show that reducing refined sugars, increasing soluble and fermentable fiber, and prioritizing slow-digesting, low-glycemic carbohydrates significantly decrease HOMA-IR, promote healthy weight loss, and enhance ovulatory patterns *(refs 2,3)*. These findings align with naturopathic frameworks that emphasize removing pro-inflammatory dietary triggers and supporting optimal metabolic signaling.

Dietary protocols enriched with healthy fats—including extra-virgin olive oil, avocados, nuts, and seeds—have been associated with meaningful improvements in insulin sensitivity, lipid profiles, and inflammatory biomarkers such as C-reactive protein (CRP). Such outcomes reflect the longstanding naturopathic emphasis on whole, minimally processed fats as therapeutic agents for restoring metabolic homeostasis *(refs 5,6)*. Similarly, omega-3 fatty acids (EPA/DHA), whether consumed through dietary sources or supplements, have demonstrated reductions in free testosterone, enhancement of menstrual regularity, and improvement in follicular health on ultrasound *(refs 3,4)*.

From a naturopathic perspective, gut-focused nutrition is another critical pillar of treatment. Emerging clinical data suggest that gut dysbiosis is highly prevalent among women with PCOS and contributes to systemic inflammation and metabolic dysregulation. Diets rich in prebiotic fibers, probiotic-containing foods, and fermentable substrates have been shown to improve intestinal permeability, modulate inflammatory pathways, and subsequently enhance insulin sensitivity *(refs 7,8)*. These mechanisms parallel the naturopathic concept of terrain restoration, which prioritizes the optimization of the internal physiological environment as a foundation for hormonal balance.

Plant-centered diets—characterized by high intakes of leafy greens, herbs and spices with anti-inflammatory and antioxidant effects (such as ginger, turmeric, and cinnamon), polyphenol-rich foods such as green tea, and low-glycemic fruits—further contribute to metabolic regulation. Evidence suggests that such dietary patterns reduce oxidative stress, improve adiponectin levels, and promote hormonal equilibrium *(refs 9–12)*. These benefits align with the naturopathic view of "food as medicine," which emphasizes restoring systemic balance through therapeutic nutritional choices.

Overall, evidence synthesized in this review supports the conclusion that naturopathic, nutrition-centered interventions represent a safe, cost-effective, and multidimensional therapeutic framework for PCOS management. These approaches improve metabolic parameters, reduce inflammation, enhance gut function, and stabilize hormonal rhythms, ultimately contributing to better clinical

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outcomes and improved quality of life. Future research should explore integrated protocols that combine nutrition-based interventions with structured physical activity and botanical therapies to establish comprehensive, evidence-based naturopathic treatment strategies for women with PCOS *(refs 13–15)*.

Discussion

The findings of this review indicate that naturopathic interventions exert meaningful and clinically relevant benefits on the metabolic, hormonal, and reproductive profiles of women with polycystic ovary syndrome (PCOS). Across the included studies, nutritional and botanical therapies consistently demonstrated improvements in insulin sensitivity, androgen regulation, systemic inflammation, and ovulatory function *(refs 1–4)*.

Inositol emerged as one of the most effective interventions for improving insulin resistance and enhancing ovulatory outcomes. Meta-analytic evidence indicates reductions of approximately 20–25% in HOMA-IR and significant increases in spontaneous ovulation among women treated with myo-inositol or combined MI/DCI formulations *(refs 1,2)*. These results highlight inositol as a well-tolerated alternative or adjunct to conventional medications, particularly for individuals with insulin-resistant PCOS.

Berberine, a botanical agent with pharmacologic activity comparable to metformin, demonstrated improvements in fasting insulin, lipid metabolism, and overall metabolic regulation *(refs 3,4)*. Notably, clinical data suggest that berberine may cause fewer gastrointestinal side effects than metformin, underscoring its clinical relevance for patients who do not tolerate biguanides.

Vitamin D supplementation showed consistent benefits in reducing free testosterone, lowering inflammatory markers such as C-reactive protein, and improving metabolic outcomes—especially among individuals with baseline deficiency *(refs 5,6)*. Evidence also suggests enhanced efficacy when vitamin D is combined with inositol or other naturopathic interventions.

Omega-3 fatty acids (EPA/DHA) contributed to improvements in triglycerides, inflammatory markers, and menstrual regularity *(refs 3,4)*. Their anti-inflammatory and lipid-modulating properties position them as valuable adjuncts within a comprehensive naturopathic framework.

Lifestyle modification—including nutrient-dense dietary patterns, consistent physical activity, and stress-management practices—was associated with improvements in BMI, menstrual regularity, and insulin sensitivity. Even modest weight reductions of 5–10% produced clinically significant benefits *(refs 7,8)*. Combined lifestyle and nutraceutical interventions showed synergistic effects and produced greater improvements than single-agent approaches.

Comparison of the findings summarized in Table 1 and Figure 1 indicates that multimodal naturopathic protocols may provide greater therapeutic benefits than isolated interventions. This aligns with the multifactorial nature of PCOS, where metabolic, hormonal, and inflammatory dysregulation interact simultaneously.

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Despite these promising outcomes, several methodological limitations must be acknowledged. Some clinical trials included small sample sizes, short intervention durations, or variability in supplement formulations—particularly for inositol and berberine. These heterogeneities may limit generalizability and highlight the need for standardized, high-quality future research.

Overall, the evidence synthesized in this review suggests that naturopathic therapies represent a promising complementary approach to PCOS management. By improving metabolic and hormonal markers with fewer reported side effects, these interventions may enhance quality of life, reduce dependence on pharmacologic agents, and support individualized long-term care strategies. Future research should focus on combined dietary, lifestyle, and botanical protocols to establish comprehensive, evidence-based therapeutic frameworks for women with PCOS *(refs 9–15)*.

Conclusion

Naturopathic interventions—including therapeutic nutrition, botanical medicine, targeted supplementation, and lifestyle modification—demonstrate meaningful benefits for improving metabolic, hormonal, and reproductive outcomes in women with polycystic ovary syndrome (PCOS). Among the reviewed therapies, inositol and berberine exhibited the strongest metabolic effects, particularly in reducing insulin resistance and improving lipid profiles *(refs 1–4)*. Vitamin D and omega-3 fatty acids contributed primarily to hormonal balance and reductions in systemic inflammation *(refs 5–6)*.

Lifestyle modification, including adherence to anti-inflammatory and low-glycemic dietary patterns, regular physical activity, and structured stress-management strategies, not only enhances overall metabolic health but also amplifies the effects of other naturopathic interventions through synergistic mechanisms *(refs 7–8)*.

The collective evidence supports a personalized, combination-based approach as the most effective therapeutic strategy. Nevertheless, high-quality clinical trials with larger sample sizes, longer intervention durations, and standardized dosing protocols are needed to determine optimal regimens and long-term efficacy in the naturopathic management of PCOS *(refs 9–15)*.

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