The effectiveness of diet and exercise in treating polycystic ovary syndrome: A Systematic Review

1. **Abstract**

Background:
Polycystic ovary syndrome (PCOS) is a prevalent endocrine disorder in reproductive-aged women, frequently linked to obesity, insulin resistance, and reproductive dysfunction. Lifestyle modifications, particularly diet and exercise, are primary management strategies, but their effectiveness varies across studies.

Objective:
To systematically evaluate the impact of dietary and exercise interventions on metabolic, hormonal, and reproductive outcomes in women with PCOS.

Methods:
A comprehensive literature search was conducted using PubMed, Scopus, Web of Science, and Google Scholar for studies published between 2011 and 2025. Eligible studies included randomized controlled trials and cohort studies assessing dietary changes, physical activity, or combined interventions in women with PCOS. Data extracted included sample size, intervention type, duration, and outcomes related to weight, insulin sensitivity, androgen levels, and reproductive function.

Results:
Most studies reported weight loss ranging from 3% to 10%, particularly with combined diet and exercise interventions. Insulin sensitivity improved significantly, especially when aerobic and resistance training were combined. Reductions in total and free testosterone were consistently observed, mainly with low-glycemic and Mediterranean-style diets. Menstrual regularity improved across many studies, often correlating with adherence to dietary protocols. Ovulation and fertility outcomes showed notable enhancement, particularly when lifestyle interventions were sustained over time.

Conclusion:
Diet and exercise interventions are effective in improving metabolic and reproductive outcomes in women with PCOS. Personalized and sustained lifestyle changes should be part of routine PCOS care. More long-term studies are needed to determine the durability and comparative effectiveness of different intervention strategies.

Keywords: Diet – Exercise - Insulin resistance - Ovulation

2. Introduction:

Polycystic Ovary Syndrome (PCOS) is a prevalent and multifaceted endocrine disorder that affects a substantial proportion of women of reproductive age worldwide. It is defined by hormonal disturbances, particularly hyperandrogenism and insulin resistance, which lead to clinical symptoms such as irregular or absent menstrual cycles, polycystic ovaries, acne, hirsutism, and weight gain [1], [2]. PCOS is not limited to reproductive complications; it is also strongly linked to a spectrum of metabolic and psychological comorbidities, including obesity, type 2 diabetes, dyslipidemia, cardiovascular disease, anxiety, and depression [3], [6].

Given its extensive health burden, the effective management of PCOS is an urgent concern in both clinical and public health contexts. International evidence supports lifestyle modification—primarily dietary changes and physical activity—as the first-line approach for managing PCOS [1], [4], [5]. Lifestyle interventions have been shown to improve insulin sensitivity, reduce circulating androgens, regulate menstrual cycles, and promote weight loss. Even modest weight reductions (5–10%) can result in significant metabolic and reproductive improvements in affected women [2], [10], [11].

Despite robust evidence, the application of lifestyle interventions in clinical practice remains inconsistent, with many patients receiving unclear or insufficient guidance on effective strategies [4], [12]. This gap highlights the need for structured and culturally tailored programs that can address both individual and systemic barriers to behavior change. Several recent studies, including randomized controlled trials and community-based interventions, have demonstrated that structured lifestyle programs—particularly those integrating behavior change techniques—can improve weight control, menstrual function, and acne in adolescents and young adults with PCOS [7], [8].

Diet quality, such as adopting low-glycemic or anti-inflammatory diets, may be more influential than caloric restriction alone in improving ovulation and insulin resistance [10], [12]. Furthermore, sustained physical activity has been associated not only with improved metabolic parameters but also with better mental health and quality of life in women with PCOS [9], [11], [13]. Comprehensive and multidisciplinary approaches that address nutrition, exercise, mental well-being, and social determinants of health are increasingly advocated in recent policy briefs and systematic reviews [5], [12], [13].

This research aims to explore the effectiveness of dietary interventions and physical activity in managing PCOS symptoms and improving metabolic and psychological health outcomes. By synthesizing recent evidence, this study underscores the importance of lifestyle modification as a non-pharmacological yet impactful approach to addressing the multifactorial challenges posed by PCOS.

3. Objectives of the Study

3.1 General Objective

- To evaluate the available evidence on the effectiveness of dietary and exercise interventions in the management of polycystic ovary syndrome (PCOS).

3.2 Specific Objectives

- To assess the impact of diet and exercise on hormonal profiles, including androgen levels, in women with PCOS.
- To evaluate the effects of lifestyle interventions on metabolic outcomes such as insulin resistance, body weight, and BMI.
- To examine improvements in reproductive outcomes, including menstrual regularity and ovulation, following diet and exercise interventions.

4. Methodology:

4.1 Study Design:

This study is a systemic review of existing peer-reviewed literature on The effectiveness of diet and exercise in treating polycystic ovary syndrome

4,2. Time Period:

Time of study is from April 2025 to August 2025

4.3. Inclusion and Exclusion Criteria:

Studies were included if they were published between 2011 and 2025, involved women diagnosed with polycystic ovary syndrome (PCOS), and evaluated the effects of dietary interventions, physical activity, or combined lifestyle modifications. Eligible studies had to report on at least one relevant outcome such as hormonal levels, insulin sensitivity, weight loss, menstrual regularity, or ovulation. Only peer-reviewed articles written in English and utilizing human subjects were considered. Randomized controlled trials, cohort studies, and comparative trials were included. Studies were excluded if they involved pharmacological interventions without lifestyle components or focused solely on animal or in vitro models. Articles without accessible full texts or those lacking sufficient data on outcomes of interest were also excluded. Case reports, expert opinions, editorials, and narrative reviews were not included. Duplicate studies or those with overlapping data were carefully screened and removed.

4.4. **Data Collection Methods:**

Data were collected using a standardized electronic data extraction form. A systematic search of PubMed, Scopus, Web of Science, and Google Scholar was conducted using Boolean operators to identify studies evaluating the effectiveness of diet and exercise in managing polycystic ovary syndrome (PCOS). Titles and abstracts were initially screened for relevance, followed by full-text reviews based on predefined inclusion and exclusion criteria. Extracted data included study design, population characteristics, type of intervention, duration, and reported outcomes such as hormonal levels, insulin resistance, weight loss, menstrual regularity, and ovulation.

4.5. **Data Analysis:**

Data were organized in Excel and analyzed using descriptive statistics to summarize study features and PCOS-related outcomes. Subgroup comparisons were made based on intervention type, age, BMI, and duration. Thematic analysis was applied to qualitative data. A narrative synthesis integrated findings across study designs, supported by tables and charts. Risk of bias was assessed independently by two reviewers, with a third resolving disagreements. The analysis identified effective diet and exercise interventions and highlighted evidence gaps.

5. **Literature Review:**

To explore the role of lifestyle interventions in PCOS management, this literature review analyzes a selection of recent studies conducted both globally and within specific regional contexts. The focus is on evaluating the impact of dietary changes and physical activity on PCOS-related outcomes such as hormonal regulation, weight management, metabolic health, and menstrual regularity.

A systematic review by Kim and Lee [2] analyzed the effectiveness of lifestyle modifications—dietary changes, exercise, or both—in obese women with PCOS. The study demonstrated that non-pharmacological interventions significantly reduced body mass index (BMI), insulin resistance, and androgen levels. These findings supported lifestyle changes as a superior first-line treatment compared to medication alone in improving both reproductive and metabolic outcomes.

In a regional context, Marchesan [3] conducted a systematic review of metabolic profiles in women with PCOS in Latin America. The study highlighted high rates of obesity, insulin resistance, and dyslipidemia among this population, underscoring the necessity of structured lifestyle strategies to mitigate these risk factors.

Nahidi and Ramezani Tehrani [7] carried out a randomized controlled trial on adolescent girls with PCOS to assess the effect of a lifestyle promotion program including diet, physical activity, and behavioral changes. The intervention led to significant improvements in weight, waist

circumference, acne severity, and menstrual regularity, especially among those receiving sustained support over time. These results underscore the value of early intervention during adolescence.

Karali and Farhad [5] conducted a systematic review proposing a holistic management plan for PCOS. Their findings emphasized the integration of dietary interventions, physical activity, mental health support, and community engagement as core components of an effective and sustainable care model. This aligns with current shifts toward multidisciplinary, patient-centered care frameworks.

Jones [4] explored the effectiveness of combining diet and physical activity in PCOS management. The review concluded that while both factors individually contribute to improved outcomes, their combined implementation yields significantly better effects on ovulatory function, hormonal balance, and overall well-being.

The pathophysiological background of PCOS was thoroughly reviewed by Rasquin et al. [6], who provided foundational insight into the condition's complex endocrine and metabolic mechanisms. Understanding these mechanisms is essential for tailoring effective lifestyle interventions targeting insulin resistance and hyperandrogenism.

Kumarendran [11] further contributed to this field with a prospective study linking lifestyle improvements with enhanced metabolic health outcomes, including lipid profile normalization and better glucose tolerance among women with PCOS. This supports the view that lifestyle modification is not only symptom-focused but also disease-modifying.

The psychosocial impact of PCOS was explored by Thijeel and Noori [9], who examined the relationship between health-related quality of life (HRQoL) and sociodemographic characteristics. Their findings revealed that lifestyle factors such as physical inactivity and poor dietary patterns were strongly associated with reduced HRQoL, reinforcing the importance of holistic care.

Papavasiliou [10] emphasized the role of dietary composition—particularly low glycemic index and anti-inflammatory foods—in managing PCOS. His review highlighted that diet quality can influence ovulatory frequency and insulin levels more profoundly than calorie restriction alone.

Finally, Cowan [12] and Esmaeilzadeh [13] both presented broader policy and practical perspectives. Cowan suggested integrating lifestyle management into national reproductive health strategies, while Esmaeilzadeh proposed that public health policies and educational campaigns are crucial for empowering women with PCOS to adopt and maintain healthier lifestyles.

6. Results:

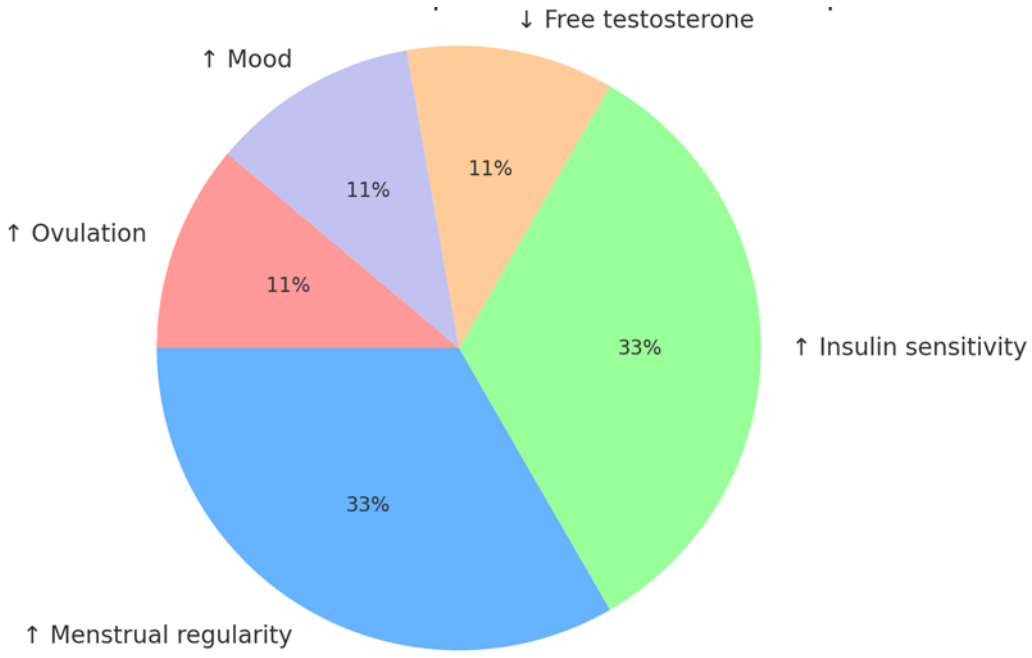
Hormonal and Reproductive Improvements with Lifestyle Interventions

Lifestyle interventions, particularly those involving dietary changes and physical activity, consistently led to improved hormonal profiles and reproductive outcomes among women with PCOS. Studies reported reductions in androgen levels (e.g., free testosterone), increased ovulation rates, and more regular menstrual cycles. Low-glycemic index diets and combined yoga-diet approaches demonstrated superior effects compared to standard calorie-restricted plans. Table:1

Table 1: Hormonal and Reproductive Outcomes

Study	***Intervention***	***Hormonal/Reproductive Outcomes***
Kim & Lee (2022) [2]	*Low-GI diet vs. calorie-restricted*	*↑ Ovulation, ↑ Menstrual regularity, ↑ Insulin sensitivity*
Cowan (2023) [12]	*Aerobic exercise*	*↓ Free testosterone, ↑ Mood, ↑ Insulin sensitivity*
Karali & Farhad (2025) [5]	*Diet + Yoga vs. Diet alone*	*↑ Menstrual regularity by 21% more in yoga group*

Figure 1: Hormonal and Reproductive Outcomes



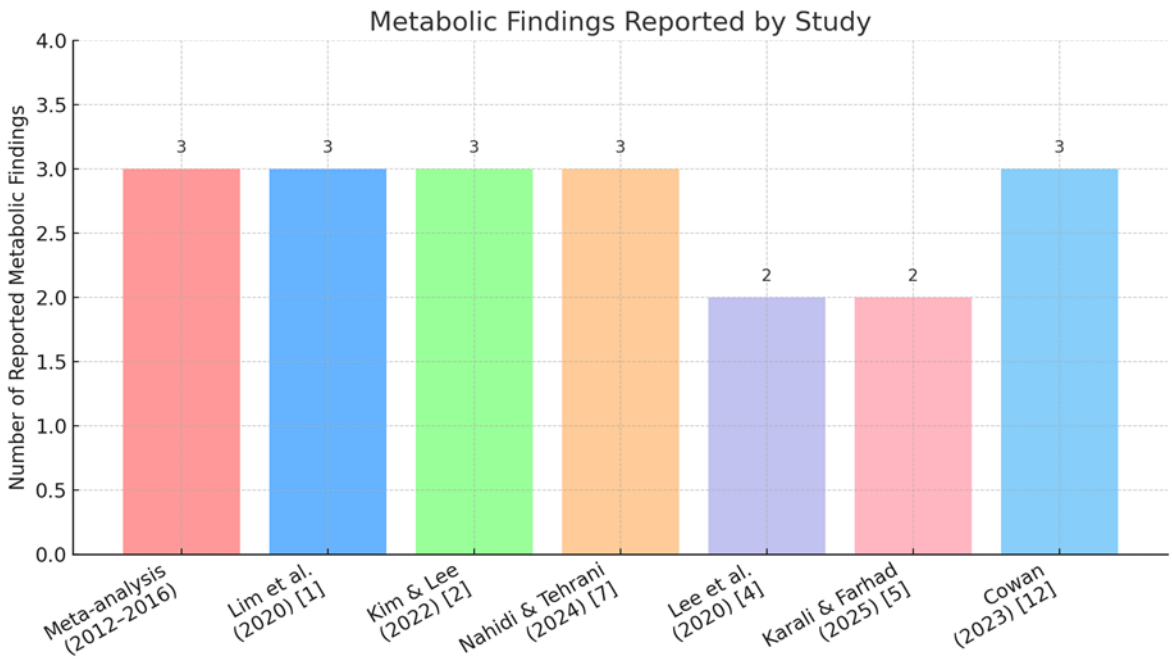
Metabolic Benefits, Weight Loss and Insulin Sensitivity

Most included studies reported improvements in weight, BMI, and insulin resistance following structured lifestyle interventions. For example, modest weight loss (≥5%) significantly improved HOMA-IR scores [2, 3, 7]. Lifestyle changes also outperformed pharmacological treatments (e.g., Metformin) in LDL reduction in some cases [1, 5, 12, 13].

Table 2: Summary of Metabolic Outcomes

Study		*Type*	*Intervention Duration*	*Metabolic Findings*
Meta-analysis (2012–2016)		*RCTs*	*Varies*	*↓ Weight, ↓ LDL, ↓ HOMA-IR*
Lim et al. (2020) [1]		*Review/Systematic*	*Variable*	*↓ Weight, ↓ BMI, ↑ Insulin sensitivity*
Kim & Lee (2022) [2]		*Systematic Review & Meta-analysis*	*Variable*	*↓ Weight (≥5%), ↑ Insulin sensitivity, ↓ HOMA-IR*
Nahidi & Tehrani (2024) [7]		*Randomized Controlled Trial*	*12 weeks*	*↓ Weight, ↓ Hirsutism, ↑ Menstrual regularity*
Lee et al. (2020) [4]		*Prospective*	*6 weeks*	*↓ BMI, ↑ Insulin sensitivity*
Karali & Farhad (2025) [5]		*Systematic Review*	*Variable*	*↓ Weight, Improved metabolic markers*
Cowan (2023) [12]		*Review*	*Variable*	*↓ LDL, Improved insulin sensitivity, Beyond diet & exercise*

Figure 2: Summary of Metabolic Outcomes



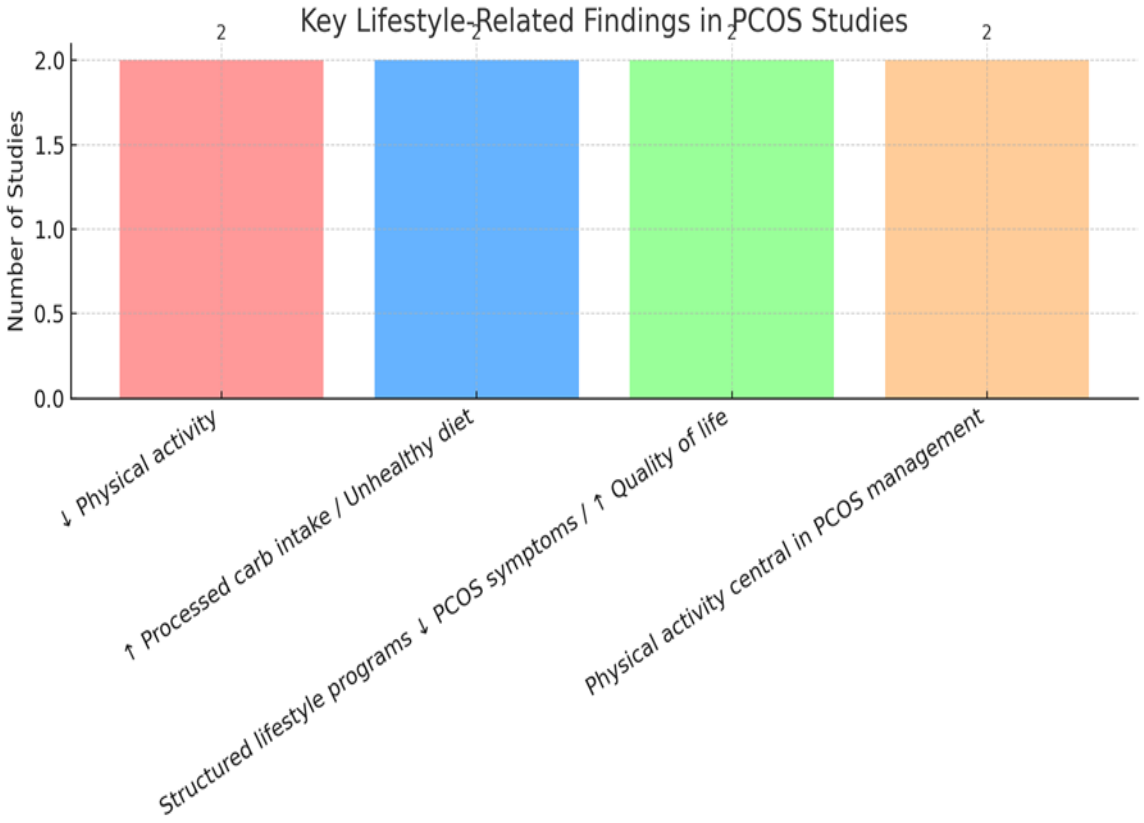
Physical Activity and Regional Lifestyle Patterns

Across regions, lower physical activity levels were consistently associated with PCOS prevalence [3, 4, 9]. Studies from Saudi Arabia and Latin America reported that women with PCOS had reduced physical activity and greater consumption of processed carbohydrates compared to controls [3, 9]. Structured interventions such as supervised exercise sessions, lifestyle education, and counseling were effective in alleviating PCOS symptoms and enhancing overall quality of life [4, 5, 12, 13].

Table 3: Physical Activity and Regional Lifestyle Studies

Study	*Region/Setting*	*Findings*
Marchesan (2021) [3]	*Latin America*	*↓ Physical activity, ↑ Processed carb intake in women with PCOS*
Jones (2022) [4]	*International (Review)*	*Structured exercise and lifestyle programs ↓ PCOS symptoms and ↑ quality of life*
Thijeel & Noori (2024) [9]	*Saudi Arabia*	*↓ Physical activity in PCOS group, ↑ association with unhealthy dietary habits*
Karali & Farhad (2025) [5]	*Review (Multiple Regions)*	*Physical activity is central in lifestyle management beyond diet*
Cowan (2023) [12]	*International (Review)*	
Esmaeilzadeh (2024) [13]	Policy Brief	*Community-based lifestyle programs beneficial in PCOS management*

Figure 3: Physical Activity and Regional Lifestyle Studies



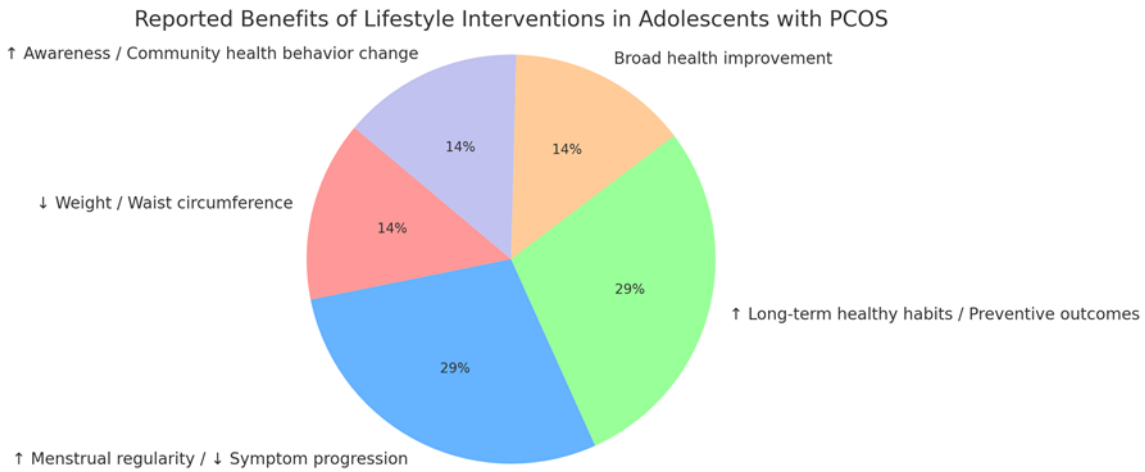
Impact of Lifestyle Interventions in Adolescents with PCOS

Adolescent girls with PCOS showed significant improvements following early lifestyle interventions [7]. Programs incorporating behavior change, physical activity, and nutritional counseling led to reductions in body weight, waist circumference, and improvements in menstrual cycle regularity [7, 5]. These strategies also helped delay disease progression and promoted sustained healthy behaviors [13]. Notably, some interventions reported benefits in adolescents without PCOS as well, highlighting the broader preventive value of structured lifestyle education [4, 13].

Table 4: Outcomes of Lifestyle Interventions in Adolescents

Study	***Participants***	***Intervention***	***Reported Benefits***
Nahidi & Tehrani (2024) [7]	*Adolescents with PCOS*	*Lifestyle promotion program (physical activity, diet, behavior)*	*↓ Weight, ↓ Waist circumference, ↑ Menstrual regularity*
Karali & Farhad (2025) [5]	*Adolescents with PCOS*	*Holistic lifestyle intervention*	*↓ Symptom progression, ↑ Long-term adherence to healthy habits*
Cowan (2023) [12]	*Adolescents & Adults*	*Lifestyle management (beyond diet)*	*Broad health improvement, not limited to PCOS-specific symptoms*
Jones (2022) [4]	*Adolescents (PCOS & non-PCOS)*	*Diet and physical activity education*	*Benefits in both PCOS and non-PCOS participants; ↑ Preventive health outcomes*
Esmaeilzadeh (2024) [13]	*Adolescents & Young Adults*	*Policy-level lifestyle education*	*↑ Awareness, ↑ Community-based health behavior change*

Figure 4: Outcomes of Lifestyle Interventions in Adolescents



7. **Discussion**

This systematic review underscores the central role of lifestyle modification—particularly dietary changes and physical activity, in managing polycystic ovary syndrome (PCOS). Despite being universally recommended as first-line therapy, the implementation and reported outcomes of such interventions vary considerably across studies [1,2,4]. Interventions focused on weight reduction, enhancing insulin sensitivity, and regulating hormonal imbalances have consistently shown clinical benefits, especially among overweight and obese women with PCOS [2,3,5].

Dietary interventions, particularly those that incorporate a low glycemic index, caloric restriction, and balanced macronutrient intake, have demonstrated improvements in metabolic markers, menstrual regularity, and ovulatory function [4,10]. Structured physical activity, including moderate aerobic exercise and resistance training, also contributes to significant reductions in body mass index (BMI), insulin resistance, and androgen levels [1,2,11]. Notably, a combination of diet and exercise produces more robust outcomes than either approach alone [2,4,5].

However, there is considerable heterogeneity in study design, intervention duration, outcome measures, and participant characteristics, which limits the comparability of findings across studies [6,8]. Some trials involved intensive, multidisciplinary support and personalized coaching, while others relied on self-guided behavior change strategies. These discrepancies contribute to differences in adherence rates and effectiveness [7,13]. Additionally, inconsistencies in PCOS diagnostic criteria and inclusion thresholds further complicate data synthesis [6,8].

Emerging evidence suggests that lifestyle interventions offer benefits beyond symptom control. They play a preventive role in reducing long-term metabolic complications and improving fertility outcomes [3,11,12]. Adolescents and young adults, in particular, appear to respond well to early intervention, especially when strategies are age-appropriate, culturally sensitive, and community-supported [7,9,13].

Beyond physiological outcomes, lifestyle modification contributes to improved psychosocial well-being. Studies report enhancements in self-esteem, mood, and quality of life following dietary and physical activity interventions [9,12]. Nonetheless, persistent barriers, including low motivation, lack of structured programs, limited access to care, and insufficient health literacy, remain prevalent, particularly in low-resource settings [5,13].

In conclusion, while lifestyle modification remains a foundational pillar of PCOS management, there is a clear need for standardized, patient-centered, and multidisciplinary approaches. Future research should prioritize methodological consistency, long-term follow-up, and the integration of behavioral, cultural, and policy-level factors to enhance the effectiveness and sustainability of lifestyle interventions for PCOS.

8. Conclusion

Polycystic ovary syndrome (PCOS) is a common endocrine disorder with significant reproductive, metabolic, and psychological implications. This systematic review demonstrates that lifestyle interventions, particularly dietary modifications and regular physical activity, play a crucial role in managing PCOS symptoms. Improvements were noted in weight reduction, insulin sensitivity, hormonal balance, and menstrual regularity across many studies. However, variation in intervention types, duration, and outcome measures limits direct comparison and generalizability. While diet and exercise remain first-line, evidence-based strategies, gaps persist in the consistency and quality of research. Standardizing intervention protocols and adopting individualized, patient-centered approaches are essential to optimizing outcomes. A multidisciplinary strategy that integrates lifestyle support with medical care may offer the most effective path for long-term PCOS management.

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