

Systematic Review

Effectiveness of Physical Activity and Diet Interventions to Improve Insulin Resistance, Hyperandrogenism, and Body Composition in Polyendocrine Metabolic Ovarian Syndrome: A Systematic Review

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Abstract

Polyendocrine metabolic ovarian syndrome (PMOS) is a prevalent and complex endocrine disorder, often underdiagnosed due to its heterogeneous clinical presentation and diagnostic criteria. Lifestyle interventions, including dietary modifications and physical activity, are widely recommended as first-line strategies to manage cardiometabolic risk; however, their effects on hormonal regulation remain less clearly defined. The aim of this systematic review is to synthesize current evidence on the effectiveness of dietary and physical activity interventions in adult women diagnosed with PMOS and to critically examine the consistency of their effects across metabolic and hormonal outcomes, addressing an important gap in the scientific literature. This review was prospectively registered in PROSPERO (ID: CRD420251246379) and follows PRISMA guidelines, and was conducted in December 2025 using PubMed, Web of Science, and ScienceDirect databases. Methodological quality of each study was assessed using the NIH Quality Assessment Tool for Controlled Intervention Studies. As results, 1054 records were identified, and 22 studies met the inclusion criteria. Lifestyle modifications, particularly energy-restricted diets, structured exercise programs, and their combination, were associated with improvements in body composition and metabolic parameters. However, a more heterogeneous and less predictable response was observed in hormonal outcomes, suggesting a partial dissociation between metabolic improvements and endocrine regulation in women diagnosed with PMOS. This variability reflects the complexity of PMOS and the influence of factors such as phenotype and baseline metabolic status. Overall, while diet and physical activity strategies effectively improve metabolic health, their impact on hormonal balance is less consistent, highlighting the need for more personalized approaches and well-designed trials with standardized criteria and longer follow-up.

Keywords: PCOS; diet; physical activity; insulin resistance; hormones; fat mass; PMOS



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1. Introduction

Polyendocrine metabolic ovarian syndrome (PMOS), previously known as polycystic ovary syndrome (PCOS), is one of the most common endocrine–metabolic disorders affecting women of reproductive age (between 10 and 13%, and over 70% of cases remain undiagnosed) [1,2]. The syndrome is characterized by a complex interaction among insulin resistance, hyperandrogenism, reproductive dysfunction, and alterations in body composition, resulting in substantial heterogeneity in clinical presentation. Beyond reproductive manifestations, PMOS is associated with an increased risk of obesity, dyslipidemia, type 2 diabetes, and cardiovascular complications, making it a major concern for women's health worldwide. Consequently, identifying effective therapeutic strategies capable of improving both metabolic and endocrine dysfunctions remains a clinical priority [3–5].

Lifestyle interventions, particularly dietary modification and structured physical activity, are currently recommended as first-line management strategies for women diagnosed with PMOS [6]. Numerous intervention studies have demonstrated beneficial effects on body weight, adiposity, insulin sensitivity, and other cardiometabolic risk factors. However, the magnitude and consistency of these benefits appear to differ according to the outcome evaluated. While improvements in body composition and metabolic parameters are frequently reported, endocrine outcomes appear less consistent across studies, with heterogeneous findings observed for androgenic and reproductive hormone markers. This inconsistency complicates the interpretation of the evidence and limits the ability to determine the overall effectiveness of lifestyle interventions across the multiple dimensions of the syndrome [4].

Although previous reviews have evaluated the effects of dietary and exercise interventions on specific outcomes in women diagnosed with PMOS, less attention has been given to whether improvements in insulin resistance, hyperandrogenism, and body composition occur with similar consistency across studies. Understanding this relationship is important because metabolic improvements may not necessarily translate into comparable endocrine benefits. Consequently, it remains unclear whether lifestyle interventions produce parallel improvements across the key pathophysiological domains of PMOS or whether certain domains are more responsive than others [7].

If improvements in one domain do not consistently translate into benefits in the others, treatment expectations and intervention design may need to be reconsidered. Therefore, the aim of this systematic review was to synthesize current evidence regarding the effects of dietary and physical activity interventions on body composition, insulin resistance, and hyperandrogenism in women diagnosed with PMOS, and to evaluate whether improvements are consistently observed across these clinically relevant domains.

2. Results

A total of 1054 records were identified through database searching: 532 from PubMed, 414 from Web of Science, and 108 from Science Direct. After removing 367 duplicated records, 687 unique studies remained for title and abstract screening. Of these, 662 studies were excluded on predefined eligibility criteria, including inappropriate study design (non-expected outcome ($n = 227$), animal studies ($n = 153$), study design ($n = 133$), pharmacological or alternative treatment ($n = 129$), population characteristics ($n = 18$), and foreign language ($n = 2$)). Following this stage, 25 full-text records were assessed for eligibility. Three studies were excluded: two due to overlapping data reported across multiple publications ($n = 2$) and one due to inaccessible full text. Lastly, 22 studies met the inclusion criteria and were included in the final analysis (Figure 1).

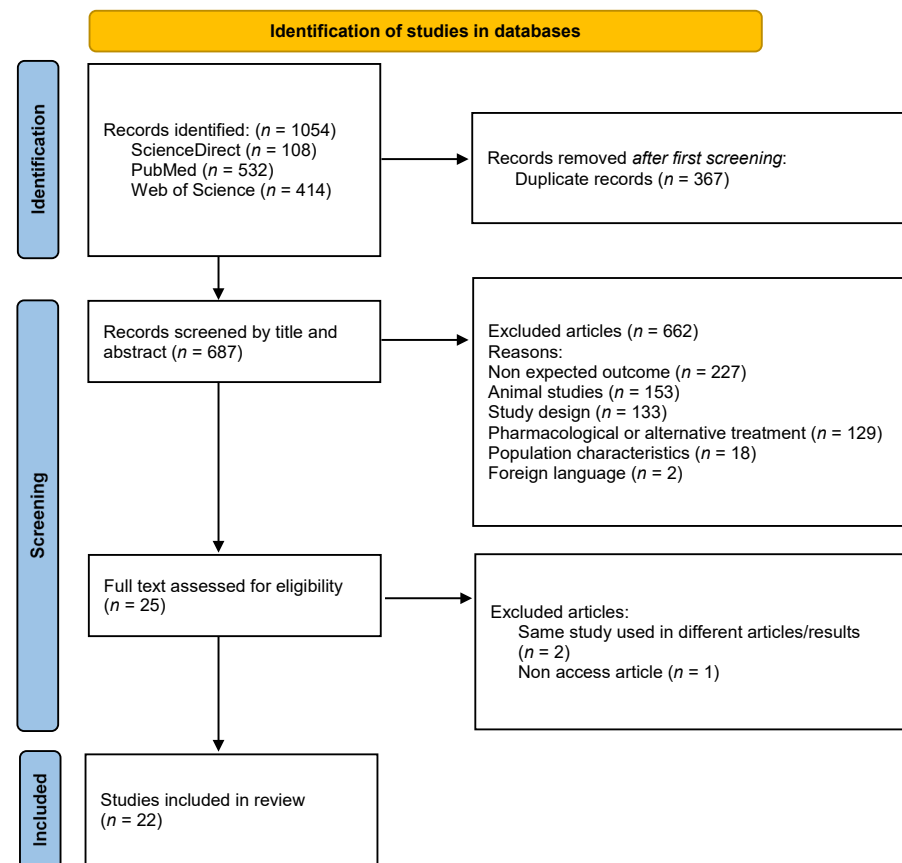


Figure 1. PRISMA flow diagram for the search strategy employed.

The present systematic review includes 22 studies that enrolled women under 45 years of age with PMOS across multiple countries from five continents. Only one article did not include the Rotterdam criteria to diagnosis PMOS in the participants and the main characteristics of the included studies are described in Table 1. The included studies showed substantial heterogeneity in sample size ($n = 8$ –144), study design (randomized, non-randomized, and single-arm interventions), and intervention duration (4 weeks to 12 months). This variability should be considered when interpreting the results, particularly for hormonal and reproductive outcomes. Most included studies were classified as having good methodological quality, while a smaller proportion were rated as fair or poor. Importantly, the main findings regarding improvements in body composition and metabolic outcomes were consistently observed among studies classified as good-quality, supporting the robustness of the overall conclusions.

Across studies, lifestyle interventions demonstrated more consistent effects on body composition and metabolic parameters than on hormonal variables. Dietary interventions, especially energy-restricted approaches, were more frequently associated with reductions in body weight and fat mass, whereas exercise-based interventions showed more variable effects, particularly in insulin resistance and hormonal outcomes. Combined interventions generally yielded broader improvements across multiple domains. Overall, the findings summarized in Table 1 suggest that interventions inducing a negative energy balance are consistently associated with improvements in body composition and metabolic parameters, whereas hormonal outcomes remain less consistent across studies.

Table 1. Characteristics of the studies evaluating the effectiveness of dietary and physical activity interventions in polycystic ovary syndrome.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
Randomized Controlled Trials					
[8] Cincione et al., Italy	<i>n</i> = 144 18–45 years old Women diagnosed with PCOS Overweight until 49.9 kg/m ²	Randomized controlled trial Two groups: - Group 1: Ketogenic diet (<i>n</i> = 73) - Group 2: Mediterranean diet (<i>n</i> = 71) The caloric intake was 500 kcal less than the individual daily caloric requirement	45 days Evaluations: - At the first visit (baseline, T0) - Final visit day (day 45, T1)	BMI Waist circumference Hip circumference WHR FM Fat-free mass Basal metabolism TBW FG FI C-peptide Serum albumin LH FSH Free testosterone Total testosterone SHBG	Significant reductions (<i>p</i> < 0.001) in anthropometric measures (body weight, BMI, waist and hip circumferences, WHR, FM), metabolic markers (glucose, insulin, HOMA-IR, and C-peptide), and androgen levels (LH, LH/FSH ratio, total and free testosterone), with greater improvements in the ketogenic group. Significant increases (<i>p</i> < 0.001) in SHBG and FSH and restoration of menstrual cyclicity were mainly observed in the ketogenic group.
[9] Ribeiro et al., Brazil	<i>n</i> = 87 18–39 years old Women diagnosed with PCOS BMI 18–39.9 kg/m ² Users and non-users of oral contraceptives included	Randomized controlled clinical trial Three groups: - CAT - IAT - Control group—no structured training CAT: continuous moderate-to-high-intensity aerobic exercise IAT: interval aerobic training with high-intensity intervals (85–90% HRmax) alternated with recovery (60–70% HRmax)	16 weeks with assessment at base week and at the end of the intervention. Training protocol: 3 sessions/week	BMI Waist circumference WHR FM LM FG FI HOMA-IR Lipid profile (Total cholesterol, HDL-c, LDL-c, triglycerides) Total testosterone FAI	Significant reductions (<i>p</i> < 0.05) in testosterone, waist circumference in CAT and IAT groups. Significant reductions (<i>p</i> < 0.03) in total cholesterol, LDL-c in CAT group. Significant reductions (<i>p</i> < 0.02) in WHR and FAI in IAT group. No significant changes in body weight, FM, LM, FG, insulin, HOMA-IR.

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[10] Nybacka et al., Sweden	<i>n</i> = 43 18–40 years old BMI > 27 kg/m ² Women diagnosed with PCOS	Randomized three-arm parallel study. Group 1: Dietary management (<i>n</i> = 14) Group 2: Exercise regimen (<i>n</i> = 17) Group 3: Both in combination (<i>n</i> = 12) Diets were individually designed under close supervision of a dietician. It was recommended that the total daily caloric intake be reduced by ≥600 kcal per day.	4 months Immediately before the study and after four months of intervention each patient were measured	BMI Waist circumference Blood pressure Fat tissue LM Bone mass Oral glucose tolerance test Lipid profile Insulin Glucose	Significant reductions in BMI (diet: <i>p</i> < 0.001; exercise: <i>p</i> < 0.05; diet + exercise: <i>p</i> < 0.001), waist circumference (diet: <i>p</i> < 0.001; exercise: <i>p</i> < 0.05; diet + exercise: <i>p</i> < 0.05), and fat mass (<i>p</i> < 0.05, diet only) were observed. Lean body mass decreased in the diet (<i>p</i> < 0.05) and diet + exercise groups (<i>p</i> < 0.001).
[11] Le Donne et al., Italy	<i>n</i> = 43 16–45 years old BMI ≥ 25 kg/m ² Women diagnosed with PCOS No hormonal therapy No drugs No regular physical activity	Blinded Randomized Clinical Trial Three groups: Group 1: Diet + myoinositol (<i>n</i> = 10) Group 2: Diet + myoinositol + D-Chiro inositol (<i>n</i> = 12) Control group: Diet (<i>n</i> = 21) Diet in all groups: 1200 kcal (25% fat, 15–18% protein and the rest of carbohydrates of low glycemic index)	180 Days, with three evaluations: Basal evaluation (Day 0) Mid-term evaluation (Day 90) Final evaluation (Day 180)	BMI Waist circumference Hip circumference FM LM TBW Oligomenorrhea	Dietary intervention significantly improved anthropometric parameters, body composition, menstrual regularity, and hirsutism, including reductions in BMI, waist circumference, fat mass (<i>p</i> ≤ 0.002), oligomenorrhea prevalence (<i>p</i> = 0.022), and Ferriman–Gallwey score (<i>p</i> = 0.001).

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[12] Almenning et al., Norway	$n = 25$ Women diagnosed with PCOS Age 27.2 ± 5.5 years BMI 26.7 ± 6.0 kg/m²	Three-arm parallel randomized controlled trial. Three groups: - HIIT - ST - Control group Participants maintained their normal diet.	10 weeks Measures at baseline and a final evaluation at week 10. Three weekly exercise sessions. An exercise physiologist supervised the exercise training at least once weekly.	BMI Waist circumference FM Visceral fat Fat-free mass VO_{2max} HR rest HR recovery Regular cycles Oligomenorrhea Amenorrhea Glucose Insulin HOMA-IR Testosterone FAI AMH SHBG DHEAS Total cholesterol HDL-c LDL-c Triglycerides Homocysteine Adiponectin C-reactive protein Leptin	Strength training significantly reduced fat mass and AMH (both $p = 0.04$), whereas HIIT significantly improved HDL-c ($p = 0.04$) and HOMA-IR ($p = 0.01$). No significant changes were observed in C-reactive protein, adiponectin, or leptin.

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[13] Deshmukh et al., UK	<i>n</i> = 22 Ages between 18 and 45 years BMI between 30 and 45 kg/m ² Women diagnosed with PCOS	Open-label, randomized controlled trial, comparative study Group 1: VLCD (<i>n</i> = 11) Group 2: Moderate Energy Deficit (<i>n</i> = 11)	8 weeks - Participants attended an initial visit (Visit 1) - Visit 2 (baseline evaluation), conducted within 4 weeks of Visit 1 - Visit 6: 8-week follow-up For the first eight weeks, the VLCD group was instructed to follow a prescription of 800 kcal.	BMI Waist circumference Hip circumference FG FI HOMA-IR Lipid profile High-sensitivity C-reactive protein Blood pressure DHEAS FAI Androstenedione SHBG LH FSH HbA1c	Significant reductions in body weight and BMI (both $p < 0.0001$) were observed in both groups, whereas significant reductions in waist circumference ($p = 0.003$), WHR ($p = 0.040$), FAI ($p = 0.005$), and fasting glucose ($p = 0.010$) and increases in SHBG ($p = 0.002$) were observed only in the VLCD group. HOMA-IR improved in both groups ($p \leq 0.009$).
[14] Sharifi et al., Iran	<i>n</i> = 40 Fertile age (18–45 years) BMI ≥ 25 kg/m ² Women diagnosed with PCOS	Open-label, randomized clinical trial Group 1: PMCD (<i>n</i> = 21) Group 2: Keto diet (<i>n</i> = 19) 500–700 kcal was removed from the total caloric intake of each person and then its macronutrient distribution was calculated based on the type of diet.	8 weeks Measurements at baseline Final evaluation (at the end of the 8 weeks)	BMI Waist circumference Hip circumference Waist-circumference ratio TBW FG FI HOMA-IR Lipid profile LH FSH Testosterone DHEAS	Significant improvements ($p < 0.05$) in BMI, FM, FG, insulin resistance, lipid profile, LH, DHEA-S, and testosterone were observed in both groups. Greater improvements in body composition and reproductive hormones were observed in the ketogenic diet group, whereas greater improvements in HDL-c and LDL-c were observed in the PMCD group.

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[15] McBairty et al., Canada	<i>n</i> = 60 Women aged 18 to 35 years Women diagnosed with PCOS using criteria specified in the PCOS report of the Androgen Excess and PCOS Society	Single-blind, parallel, stratified-randomized clinical trial Group 1: Pulse-based diet and aerobic exercise (<i>n</i> = 29) Group 2: TLC diet and aerobic exercise (<i>n</i> = 31)	16 weeks Baseline measures were repeated at the end of the 16-week intervention Clinical bloodwork repeated both at 9 weeks and at the end of the 16 weeks.	BMI FM LM Total Testosterone Estradiol	Significant reductions in BMI ($p = 0.005$), fat mass ($p = 0.0016$), and total testosterone ($p = 0.02$) were observed following the intervention, whereas no significant changes were found in lean mass or estradiol levels.
[16] Patten et al., Australia	<i>n</i> = 29 Caucasian women 18–45 years old BMI > 25 kg/m ² Insufficiently active Women diagnosed with PCOS	Two-armed randomized clinical trial Group 1: HIIT (<i>n</i> = 15) Group 2: MICT (<i>n</i> = 14)	12 weeks Baseline and post intervention (after 12 weeks) evaluations.	BMI Waist circumference Hip circumference WHR FM LM FG FI HOMA-IR FAI Androstenedione SHBG Estradiol AMH	Significant reduction in FAI ($p = 0.010$), increased SHBG, improved insulin sensitivity (GIR) and menstrual cyclicity were observed following HIIT. No significant changes were found in body weight, fat mass, or other reproductive hormones, including testosterone, DHEAS, AMH, estradiol, progesterone, LH, and FSH.
[17] Azadi-Yazdi et al., Iran	<i>n</i> = 55 Women aged 20–40 years Overweight or obese (BMI = 25–40 kg/m ²) Newly diagnosed with PCOS	Randomized controlled clinical trial Group 1: Dash diet (<i>n</i> = 27) Control group: control diet (<i>n</i> = 28) The macronutrient compositions of intervention and control diets were the same	12 weeks Evaluation at baseline Final evaluation after 12 weeks	BMI Waist circumference Hip circumference WHR Lean body mass FM Testosterone SHBG FAI	Significant reductions in BMI ($p = 0.020$), fat mass ($p = 0.008$), and androstenedione ($p = 0.019$), as well as increases in SHBG ($p = 0.003$), were observed following the DASH diet. Testosterone and FAI decreased significantly only in crude analyses ($p \leq 0.003$).

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[18] Lee & Lee, Korea	<i>n</i> = 24 Women aged 18–40 years, Diagnosed with PCOS BMI > 25 kg/m ²	Randomized controlled trial Group 1: Lifestyle modification program delivered via a mobile application (including dietary guidance, physical activity promotion, self-monitoring, and behavioral support, <i>n</i> = 14) Control group: no lifestyle modifications (<i>n</i> = 14) 1400 and 1500 kcal/day, approximately 20% from protein, 30% from fat, and 50% from carbohydrates.	12 weeks Assessments were at baseline and at the end of 12 weeks intervention.	BMI LH FSH Estradiol Testosterone SHBG DHEA-S FI Hirsutism Acne Depression	Significant weight loss (<i>p</i> = 0.042), reductions in postprandial insulin (<i>p</i> = 0.024), and improvements in hirsutism (<i>p</i> = 0.027) and depressive symptoms (<i>p</i> = 0.018) were observed. No significant changes were found in LH, FSH, estradiol, testosterone, SHBG, or DHEA-S
Controlled Non-randomized/Quasi-experimental Studies					
[19] Pandit et al., India	<i>n</i> = 48 20–40 years old Women diagnosed with PCOS	Quasi experimental study Two groups: - Group 1: aerobic exercise (<i>n</i> = 25) and control - Control group: (<i>n</i> = 23) The physical exercise program included 20 weeks of consistent exercise (five sessions per week)	12 months Evaluation at baseline week of the intervention and a final evaluation at the end of 12 months.	BMI Waist circumference Hip circumference FG FI HOMA-IR High sensitivity C-reactive protein	Significant reductions in weight, fasting glucose, C-reactive protein (<i>p</i> = 0.001), BMI (<i>p</i> = 0.002), waist circumference (<i>p</i> = 0.029), hip circumference (<i>p</i> = 0.021), fasting insulin (<i>p</i> = 0.044), HOMA-IR (<i>p</i> = 0.004) were observed following the intervention.
[20] Abazar et al., Iran	<i>n</i> = 24 Women diagnosed with PCOS BMI (29.86 ± 3.22 kg/m ²) Average age of 26.87 ± 4.43 years	Semi-empirical, pre-test, post-test type with a control group Experimental group (<i>n</i> = 12) Control group (<i>n</i> = 12)	12 weeks Measurements before and after the intervention Aerobic exercise at moderate level for 3 sessions a week, each session for 60 min.	BMI Body fat percentage FM HDL-c LDL-c VLDL-c Triglycerides Total cholesterol	Significant reductions in BMI, WHR, body fat percentage, FM (<i>p</i> < 0.001), and triglycerides (<i>p</i> = 0.02), Significant increases in HDL (<i>p</i> < 0.001) were observed. No significant changes were found in LDL, VLDL, or total cholesterol.

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[21] Al-Eisa et al., Egypt	<i>n</i> = 90 Women with obesity 20–35 years old With and without diagnostic of PCOS	Group A: controls with BMI of 20–29 kg/m ² (<i>n</i> = 30) Group B: PCOS and BMI of 30–35 kg/m ² (<i>n</i> = 30) Group C: Women with obesity with BMI of 30–35 kg/m ² (<i>n</i> = 30) Control group: Healthy women	12 weeks 1st evaluation: at baseline Overnight fasting blood samples were taken in the early follicular phase (day 2–3 after the last menstrual period) 2nd evaluation: 3 weeks Final evaluation: 12 weeks Training intervention program of treadmill walking, 45 min three times per week.	Blood Pressure VO _{2max} BMI Waist circumference WHR Ferriman–Gallwey score FSH Estrogen Prolactin AMH Adiponectin FG FI HOMA-IR	Significant reductions (<i>p</i> < 0.05) in BMI, fasting glucose, insulin, HOMA-IR, PRL, and AMH, with increases in FSH, estradiol, adiponectin, and GIR. Improvements in ovulation and menstrual cyclicity were reported.
Prospective Single-arm Interventional Studies (No Control Group)					
[22] Pereira et al., Brazil	<i>n</i> = 22 18–35 years old BMI ≥ 25 and <39 kg/m ² Women diagnosed with PCOS	Prospective single-arm interventional study Dietary intervention consisted at inducing weight loss through 500 kcal/day energy deficit, nutritional counseling every two weeks No control group	12 weeks, with evaluation at baseline and at the end of the intervention.	BMI FSH Testosterone SHBG Progesterone Fasting glucose Fasting insulin HOMA-IR Lipid profile DNA damage markers	Significant reductions (<i>p</i> < 0.01) in BMI, FG, FI, HOMA-IR, LDL-c, testosterone. Significant increases (<i>p</i> < 0.01) in progesterone. No significant changes in triglycerides and HDL-c.

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[23] Scott et al., Australia	<i>n</i> = 16 Women diagnosed with PCOS and No PCOS BMI ≥ 25 kg/m ² Inactive (<100 min per week)	Clinical blinded trial No groups	12 weeks Participants attended three 45–60 min sessions Measurements pre and post training	BMI FM Fat-free mass Android fat mass Gynoid fat mass Android/gynoid ratio Body fat percentage FG FI HOMA-IR Glucose infusion rate relative to fat-free mass VO ₂ peak	No significant changes in total body fat, fasting glucose, insulin, or HOMA-IR. Significant improvements in android–gynoid ratio (<i>p</i> = 0.03), VO ₂ peak (<i>p</i> = 0.01), and glucose infusion rate relative to fat-free mass (<i>p</i> = 0.02) were observed.
[24] Gorczyca et al., United States	<i>n</i> = 8 21–42 years old BMI 25–44.9 kg/m ² Women diagnosed with anovulatory infertility caused by PCOS	Experimental trial No groups All participants received diets of 1200–1500 kcal/day Participants were able to choose a combination of two commercially available portion-controlled meals, three low-calorie shakes which contained 100 kcal and 15 g of protein each, and at least five one-cup equivalent servings of fruits and vegetables per day. Participants were asked to increase their daily steps by 10% each week from their current level until reaching a goal of 10,000 steps/day to reduce sedentary activity.	6 months Participants were delivered lifestyle intervention weekly and remotely. Evaluations were remote.	BMI Waist circumference % gynoid fat % android fat % body fat Hip circumference Fat mass Fat-free mass Emotions Hirsutism Infertility problems Menstrual problems	Significant reductions (<i>p</i> = 0.04) in BMI and waist circumference. No significant changes in body composition parameters (FM, body fat percentage, android fat, gynoid fat, or fat-free mass).

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[25] Seven & Baş, Turkey	<i>n</i> = 13 mean age 29.77 ± 7.54 years; median BMI 27.2 kg/m ² Women diagnosed with PCOS	Single-arm intervention A personalized low-calorie ketogenic diet was designed for each participant Reduction of 500 calories Participants were allowed to eat unlimited green leafy vegetables, cruciferous vegetables, squash, and cucumbers during the intervention.	4 weeks [One inter-menstrual period (mean duration 30.92 ± 4.92 days)]. Four visits: - 1st consent obtained - 2nd baseline (day 2–3 menstruation) blood collection, anthropometric measurements, body composition analysis, initiation of the LCKD - 3rd and 4th follow -up visits - Final visit (day 2–3 of the subsequent menstruation) blood collection, anthropometric measurements, body composition analysis	BMI Fat % FM Fat-free mass Muscle mass TBW Waist circumference Hip circumference WHR Neck circumference Glucose Insulin HOMA-IR Lipid profile FSH LH Prolactin DHEA Total Testosterone IGF-1 Androstenedione Estradiol TNF-α Menstrual cycle duration	Significant reductions (<i>p</i> ≤ 0.001) in BMI, FM, fat-free mass, muscle mass, waist circumference, hip circumference, neck circumference. Significant improvements (<i>p</i> < 0.05) in prolactin, IGF-1 and SHBG levels, with no significant changes in FSH, LH, testosterone, DHEA-S, androstenedione or estradiol.

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[26] Rossetti et al., Italy	<i>n</i> = 18 Women diagnosed with PCOS Women in fertile age	Prospective, longitudinal, single-arm pilot study	6 months Patients were evaluated at baseline and at the end of the 6-month period. All patients followed a ketogenic diet for 45 days and a low-carbohydrate diet for the subsequent 45 days	BMI Waist circumference Hip circumference FM Fat-free mass VAT mass Glucose Insulin HOMA-IR Lipid profile Clinical PCOS outcomes Estradiol FSH LH Testosterone	Significant reductions ($p < 0.05$) in body weight, fat mass, visceral fat, and waist and hip circumferences. Significant improvements in HDL-c ($p = 0.004$), triglycerides ($p = 0.022$), menstrual cycle regularity ($p = 0.012$), ovarian volume ($p = 0.029$), Ferriman–Gallwey score ($p = 0.037$), FSH ($p = 0.050$), LH ($p = 0.037$), progesterone ($p = 0.017$), and testosterone ($p = 0.048$). A trend toward improved insulin resistance was observed (HOMA-IR, $p = 0.076$).
[27] Satyko et al., Brazil	<i>n</i> = 97 18–37 years old BMI indicating a normal weight to grade 1 obesity (18–34.9 kg/m ²). Women diagnosed with and without PCOS	Non-randomized, therapeutic, open, single-arm study Group 1: PCOS PRT Group 2: NON PCOS PRT	4 months - Baseline evaluation - Final evaluation The training duration program for each participant was approximately 1 h, three times a week for 4 months.	BMI Waist circumference FG FI HOMA-IR FAI Androstenedione Testosterone Estradiol SHBG LH FSH	Significant reductions ($p < 0.01$) in waist circumference, testosterone and fasting glucose, together with improvements in lean muscle mass ($p = 0.04$). Menstrual cyclicity improved in women with menstrual irregularities. No significant changes were observed in body fat percentage, insulin concentrations, or HOMA-IR.

Table 1. Cont.

Reference, Country	Population	Study Design	Study Duration	Outcomes	Main Findings
[28] Paoli et al., Italy	<i>n</i> = 14 18–45 years old BMI ≥ 25 kg/m ² Women diagnosed with PCOS	Clinical single-arm study Keto diet about 1600/1700 kcal	12 weeks Baseline measurements Final measurements (at the end of 12 weeks)	BMI Fat body mass Lean body mass Waist circumference Glucose Insulin HOMA-IR Lipid Profile Total testosterone Free testosterone Progesterone Estradiol LH FSH DHEAS SHBG Ferriman–Gallwey Score	Significant reductions ($p < 0.0001$) in BMI, fat mass, glucose, insulin, HOMA-IR, total cholesterol, and LDL-C, with decreased triglycerides ($p < 0.0008$) and increased HDL-C ($p = 0.0146$)
[29] Alsayed et al., Egypt	<i>n</i> = 75 20–40 years old Women diagnosed with PCOS Women with overweight or obesity	Quasi-experimental trial All participants were subjected to lifestyle intervention with a hypocaloric diet (subtraction of 500 calories, with a composition of 25% proteins, 25% fat, and 50% carbohydrates), and physical activity.	12 weeks The participants attended the clinic once every two weeks At all visits, weight, waist circumference, and hip circumference were measured. Baseline assessment and a final evaluation.	BMI Waist circumference Hip circumference BF percent Visceral fat area FG FI Lipids Total testosterone Free testosterone FAI SHBG C-reactive protein Serum amyloid A	Significant reductions ($p < 0.001$) in BMI, body fat percentage, visceral fat area, glucose, insulin, HOMA-IR, LDL-c, and FAI. Significant increases ($p < 0.001$) in SHBG

AMH, Anti-Müllerian Hormone; BMI, Body Mass Index; CAT, Continuous Aerobic Training; DHEAS, Dehydroepiandrosterone Sulfate; DNA, Deoxyribonucleic Acid; FAI, Free Androgen Index; FG, Fasting Glucose; FI, Fasting Insulin; FM, Fat Mass; FSH, Follicle-Stimulating Hormone; HbA1c, Glycated Hemoglobin; HDL-c, High-Density Lipoprotein cholesterol; HIIT, High-Intensity Interval Training; HOMA-IR, Homeostatic Model Assessment of Insulin Resistance; HR, Heart Rate; HRmax, Maximum Heart Rate; IAT, Intermittent Aerobic Training; IGF-1, Insulin-like Growth Factor 1; LDL-c, Low-Density Lipoprotein Cholesterol; kcal, Kilocalorie; LH, Luteinizing Hormone; LM, Lean Mass; MICT, Moderate-Intensity Continuous Training; PMCD, Portfolio Moderate-Carbohydrate Diet; PRT, Progressive Resistance Training; SHBG, Sex Hormone-Binding Globulin; ST, Strength Training; TBW, Total Body Water; TNF- α , Tumor Necrosis Factor Alpha; VAT, Visceral Adipose Tissue; VLCD, Very-Low-Calorie Diet; VLDL-c, Very-Low-Density Lipoprotein Cholesterol; VO_{2max}, Maximal Oxygen Uptake; WHR, Waist-to-Hip Ratio.

Additionally, the methodological Quality Rating of the selected studies is described in Table 2. Most of them showed a “Fair” Quality Rating ($n = 11$), while only nine were classified as having a “good” Quality Rating.

Table 2. Methodological quality assessment tool for controlled intervention studies.

Ref.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Score	%	Quality Rating
[11]	Yes	CD	Yes	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	CD	Yes	11/14	78.6	Good
[12]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	13/14	92.8	Good
[18]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	13/14	92.8	Good
[16]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	13/14	92.8	Good
[17]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	13/14	92.8	Good
[14]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	13/14	92.8	Good
[9]	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	11/14	78.6	Good
[10]	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	11/14	78.6	Good
[13]	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	11/14	78.6	Good
[8]	Yes	CD	CD	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	Yes	10/14	71.4	Fair
[15]	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	NR	Yes	Yes	10/14	71.4	Fair
[20]	Yes	Yes	Yes	No	Yes	Yes	NR	NR	Yes	Yes	Yes	NR	Yes	Yes	10/14	71.4	Fair
[29]	Yes	NA	NA	No	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	8/14	64.3	Fair
[21]	No	NR	No	CD	CD	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	8/14	57.1	Fair
[19]	Yes	NA	NR	NA	NA	Yes	No	No	Yes	Yes	Yes	NR	Yes	Yes	7/14	50.0	Fair
[25]	Yes	NA	NA	No	NA	Yes	No	NA	Yes	Yes	Yes	Yes	Yes	NA	7/14	50.0	Fair
[27]	Yes	No	NA	No	NA	Yes	No	No	Yes	Yes	Yes	Yes	Yes	NA	7/14	50.0	Fair
[28]	Yes	NA	NA	No	NA	Yes	Yes	NA	Yes	Yes	Yes	NR	NA	Yes	7/14	50.0	Fair
[24]	Yes	NA	NA	No	NA	Yes	No	NA	Yes	Yes	Yes	NR	Yes	NA	6/14	42.8	Fair
[26]	Yes	NA	NA	No	NA	Yes	No	No	CD	Yes	Yes	Yes	Yes	NA	6/14	42.8	Fair
[22]	Yes	NA	NA	NA	NA	Yes	No	NA	Yes	NA	Yes	Yes	NA	NA	5/14	35.7	Poor
[23]	Yes	NA	NA	No	NA	Yes	No	No	Yes	Yes	Yes	No	Yes	NA	5/14	35.7	Poor

CD, cannot determine; NA, not applicable; NR, not reported. Q1: Was the study described as randomized, a randomized trial, a randomized clinical trial, or an RCT? Q2: Was the method of randomization adequate (i.e., use of randomly generated assignment)? Q3: Was the treatment allocation concealed (so that assignments could not be predicted)? Q4: Were study participants and providers blinded to treatment group assignment? Q5: Were the people assessing the outcomes blinded to the participants’ group assignments? Q6: Were the groups similar at baseline in important characteristics that could affect outcomes (e.g., demographics, risk factors, co-morbid conditions)? Q7: Was the overall drop-out rate from the study at endpoint 20% or lower of the number allocated to treatment? Q8: Was the differential drop-out rate (between treatment groups) at endpoint 15 percentage points or lower? Q9: Was there high adherence to the intervention protocols for each treatment group? Q10: Were other interventions avoided or similar in the groups (e.g., similar background treatments)? Q11: Were outcomes assessed using valid and reliable measures, implemented consistently across all study participants? Q12: Did the authors report that the sample size was sufficiently large to be able to detect a difference in the main outcome between groups with at least 80% power? Q13: Were outcomes reported or subgroups analyzed prespecified (i.e., identified before analyses were conducted)? Q14: Were all randomized participants analyzed in the group to which they were originally assigned, i.e., did they use an intention-to-treat analysis?

3. Discussion

The present systematic review was designed to explore the current scientific evidence of the effects of diet and physical activity interventions on body composition, metabolic, and hormonal outcomes in women diagnosed with PMOS. Overall, the included studies indicate that lifestyle interventions, particularly energy-restricted diets, structured exercise programs, and their combination, consistently improve body composition and metabolic parameters, whereas hormonal outcomes show greater variability. Importantly, this heterogeneity in response appears to be influenced not only by the type and intensity of the intervention, but also by individual patient characteristics. Across the reviewed studies, most participants were women of reproductive age (18–45 years), frequently presenting overweight or obesity, reflecting the typical clinical profile of PMOS. Although improvements in body composition and insulin resistance were frequently reported, the magnitude of these changes varied considerably across studies because of differences in intervention protocols, participant characteristics, and outcome assessment methods. Furthermore, emerging evidence suggests that PMOS phenotypes differ in their metabolic and endocrine profiles, which may further modulate responsiveness to lifestyle interventions. In this

context, factors such as phenotype, degree of adiposity and baseline metabolic dysfunction should be considered key determinants of treatment response, potentially contributing to the heterogeneity observed across studies [30].

The interventions analyzed in this review were heterogeneous, including dietary approaches (energy-restricted diets [$n = 8$], ketogenic diet [$n = 4$], Mediterranean diet [$n = 1$], DASH diet [$n = 1$], and low-carbohydrate diets [$n = 1$]), structured exercise programs ($n = 8$) (aerobic training [$n = 4$] and high-intensity interval training [$n = 4$]), and combined lifestyle interventions ($n = 3$). Despite this variability, several patterns emerged. Energy-restricted diets frequently reported reductions in body weight, BMI, and fat mass, suggesting that these effects are primarily driven by a negative energy balance rather than specific macronutrient distributions. In contrast, the potential added benefits of specific dietary compositions remain less clear and appear to vary across studies. More restrictive dietary approaches, particularly ketogenic diets, were associated with greater short-term improvements in body composition and metabolic markers and, in some cases, menstrual regularity [8,11,16,21,26,27]. These findings suggest that a substantial proportion of the observed benefits may be attributable to weight loss and negative energy balance. However, some studies reported metabolic and endocrine changes that appeared disproportionate to changes in body weight, indicating that dietary composition and other physiological mechanisms may also contribute to treatment response. However, these findings should be interpreted with caution, given the small sample sizes and short duration of most studies, which limit the strength and generalizability of these observations. Although interventions with longer duration (≥ 12 weeks) ($n = 17$) generally appeared to favor more sustained improvements, several short-term ketogenic interventions (4–8 weeks) also reported marked metabolic and menstrual benefits. These findings suggest that intervention characteristics, including dietary composition and adherence, may be as important as duration when determining treatment response [9–11,15–24,26–29].

Exercise interventions alone produced beneficial effects on androgen levels and cardiovascular parameters, although their impact on body composition and insulin resistance was less consistent. Notably, combined interventions (diet plus exercise) generally yielded more comprehensive benefits, supporting the synergistic role of energy intake and physical activity in PMOS management. A substantial proportion of studies reported significant reductions in BMI, waist circumference, and insulin resistance markers, reinforcing the central role of weight loss and metabolic regulation in PMOS treatment. Overall, the evidence suggests that exercise improves metabolic health in women diagnosed with PMOS; however, direct improvements in insulin sensitivity appear to be more pronounced with higher-intensity interventions. While Patten et al. reported a significant increase in insulin sensitivity following HIIT ($\Delta + 2.3 \pm 4.4$ AU; $p = 0.007$), Ribeiro et al. primarily observed reductions in central adiposity without significant changes in insulin resistance markers. These findings suggest that exercise intensity may play a key role in achieving greater improvements in insulin sensitivity among women diagnosed with PMOS [9,16].

In contrast, hormonal outcomes were less consistent. Although several studies reported reductions in total testosterone and Free Androgen Index (FAI) [9,13,16,17,22], as well as increases in Sex Hormone-Binding Globulin (SHBG), these effects were not uniformly observed across all interventions or participant populations. Some studies reported limited or no significant endocrine changes despite favorable improvements in body composition and metabolic parameters. Therefore, while androgen-related outcomes appear responsive to lifestyle interventions in a substantial proportion of studies, hormonal responses remain more variable and less predictable than metabolic outcomes. This variability may reflect differences in intervention characteristics, study duration, baseline endocrine status, participant profiles, and methodological factors across studies. Additionally, im-

provements in menstrual regularity were reported in several studies [8,11,16,21,26,27], particularly those involving more intensive dietary interventions or structured exercise programs, suggesting a potential link between metabolic improvements and reproductive function. A graphical description of the principal pathophysiological mechanisms in PMOS and the responsiveness to physical activity and diet interventions of the articles included in this systematic review are presented in Figure 2.

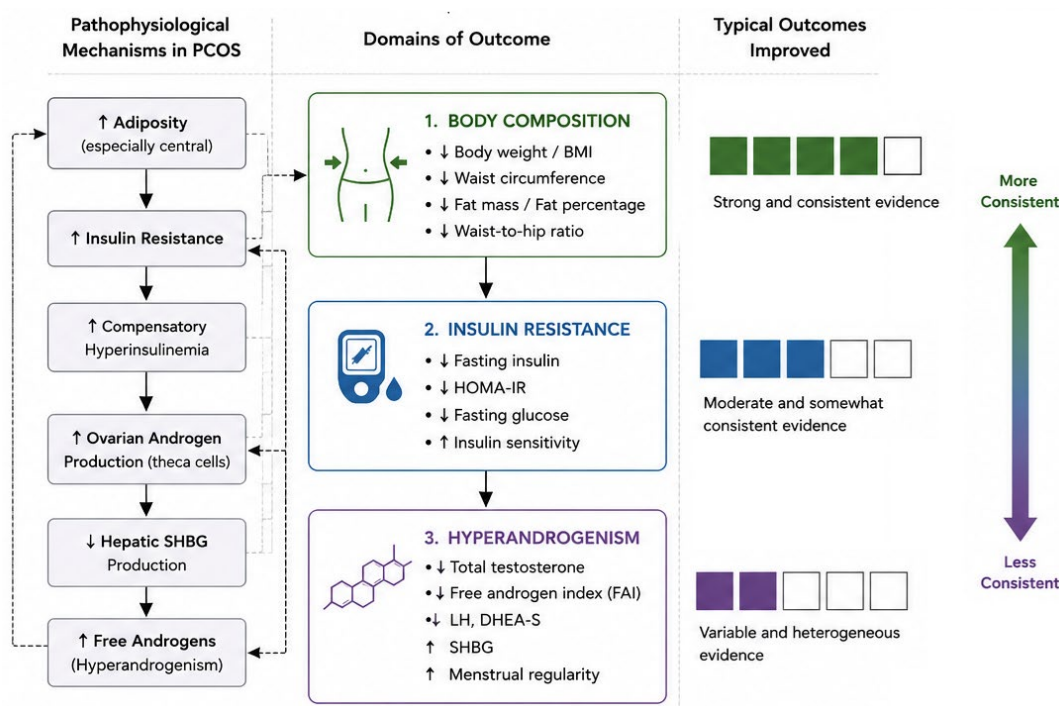


Figure 2. Relative responsiveness of the major pathophysiological domains of PMOS to lifestyle interventions. BMI, body mass index; HOMA-IR, homeostatic model assessment of insulin resistance; LH, luteinizing hormone; DHEA-S, dehydroepiandrosterone sulfate; SHBG, Sex Hormone-Binding Globulin.

The variability in findings may also be partially explained by methodological differences and risk of bias across studies. Several studies were limited by small sample sizes ($n = 8$ – 29), lack of control groups, or short intervention durations (<12 weeks), which may reduce statistical power and increase the risk of type II errors. Importantly, these limitations are particularly relevant for hormonal and reproductive outcomes, which tend to show greater intra- and inter-individual variability and may require longer follow-up periods to detect meaningful changes, potentially contributing to the inconsistent findings observed across studies. Overall, confidence in the evidence was considered moderate for outcomes related to body composition and metabolic parameters, as improvements in these variables were consistently reported across multiple studies of predominantly good methodological quality. In contrast, confidence in the evidence for hormonal outcomes was lower due to greater heterogeneity in study findings, intervention characteristics, participant phenotypes, and follow-up duration. These considerations should be considered when interpreting the conclusions of this review.

An additional strength of the evidence is the diagnostic criteria used for PMOS. Most of the included studies ($n = 21$) employed the Rotterdam criteria, with only one study using a different approach [15]. While the widespread use of these criteria provides a degree of methodological consistency, it does not eliminate clinical heterogeneity, as the inclusion of different PMOS phenotypes, particularly non-hyperandrogenic forms, may influence both baseline characteristics and responsiveness to interventions. Notably, this

issue was difficult to evaluate across the included studies because detailed phenotypic information was inconsistently reported. Although most studies diagnosed participants according to the Rotterdam criteria, few provided phenotype-specific analyses or stratified outcomes according to clinical presentation. Consequently, it remains uncertain whether differences in treatment responsiveness were attributable to the interventions themselves or to underlying phenotypic variation among participants. This limitation may partially explain the greater heterogeneity observed in hormonal outcomes compared with body composition and metabolic parameters and highlights the importance of incorporating phenotype-specific analyses in future intervention studies.

An additional consideration when interpreting the findings of this review is the ongoing evolution in the conceptualization of PMOS itself. Recently, an international expert panel proposed replacing the term PCOS with PMOS [17], arguing that the current nomenclature inadequately reflects the complex endocrine and metabolic nature of the disorder and overemphasizes the ovarian morphology component. This proposal emerged from growing recognition that PMOS encompasses a broad spectrum of reproductive, metabolic, and endocrine disturbances that extend beyond the presence of polycystic ovarian morphology. From the perspective of lifestyle intervention research, this shift is particularly relevant because it reinforces the notion that women diagnosed under the same label may present markedly different metabolic and hormonal profiles, which could influence treatment responsiveness. The heterogeneous outcomes observed across the studies included in this review, especially regarding hormonal variables, are consistent with this evolving understanding of the syndrome and further support the need for more precise phenotypic characterization in future research. Such an approach may facilitate the development of more individualized therapeutic strategies and improve the interpretation and comparability of intervention studies.

This review is subject to certain limitations. First, the search was restricted to articles published in English, which may have resulted in language bias and the exclusion of potentially relevant studies published in other languages. Additionally, the search was limited to studies published between 2015 and 2025; therefore, earlier evidence that may have contributed to the understanding of dietary and physical activity interventions in PMOS was not considered. The main limitations of this systematic review are largely related to the characteristics of the included studies. A considerable proportion of studies had small sample sizes and short intervention durations, which limit both the external validity of the findings and the ability to assess long-term sustainability. Additionally, the inclusion of participants with varying degrees of adiposity, metabolic disturbances, and lifestyle habits introduces heterogeneity that may influence the observed effects. However, beyond these expected limitations, a key challenge lies in the inability to clearly identify which patient profiles are most likely to benefit from specific lifestyle interventions. Differences in PMOS phenotypes, baseline metabolic status, and degree of adiposity are likely to modulate treatment response, yet these factors are not consistently accounted for across studies. As a result, the observed variability in outcomes, particularly in hormonal and reproductive parameters, may reflect not only differences in the intervention design, but also an incomplete understanding of patient stratification. This limitation highlights the need for future research to adopt more stratified approaches, incorporating detailed phenotyping and baseline metabolic characterization to better define individualized therapeutic strategies in PMOS.

4. Materials and Methods

The present systematic review was prospectively registered in the PROSPERO database (ID: CRD420251246379) and conducted in accordance with the Preferred Report-

ing Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Supplementary S1 [31]). All stages of the review process, including database searching, duplicate removal, study selection, data extraction, and methodological quality assessment, were independently performed by two reviewers (M.Z.T.-V. and M.A.H.-L.), and discrepancies were resolved through discussion and consensus.

The studies included in this systematic review were selected according to the PICO framework as follows:

- P (Population): adult (>18 years old) woman diagnosed with PMOS.
- I (Intervention/Exposure): Dietary interventions and/or structured physical activity programs aimed at improving metabolic, hormonal, or body composition outcomes in women diagnosed with PMOS. Studies in which dietary or exercise interventions constituted the primary component of the intervention were considered eligible.
- C (Comparison): Control groups receiving no intervention, usual care, or alternative non-pharmacological interventions. In some cases, comparisons between subgroups with different baseline characteristics or intervention exposures were also considered; however, these were interpreted with caution due to their potential contribution to heterogeneity.
- O (Outcome): Changes in body composition (body weight, BMI, fat mass, lean mass, waist circumference), hormonal parameters related to hyperandrogenism and reproductive function (e.g., testosterone, SHBG, FAI, LH, FSH, estradiol), and metabolic outcomes (e.g., fasting glucose, fasting insulin, HOMA-IR, lipid profile).

The databases included in the literature search were PubMed, Web of Science, and Science Direct, based on the criteria defined by the PICO framework. These databases were selected because they provide extensive coverage of biomedical and health sciences literature, including research in endocrinology, nutrition, physical activity, and women's health, which are central to the scope of this review. The combined use of these sources was considered sufficient to identify relevant peer-reviewed studies addressing non-pharmacological interventions in PMOS. A standardized keyword-based search strategy was applied across PubMed, Web of Science, and ScienceDirect to ensure consistency and comparability across databases. The search focused on terms related to polycystic ovary syndrome, non-pharmacological management, dietary interventions, physical exercise, body composition, and hormonal outcomes. Controlled vocabularies specific to individual databases (e.g., MeSH terms) were not incorporated, as equivalent indexing systems are not uniformly available across all databases included in this review. Specific keywords and Boolean operators were established to develop the search strategy, resulting in the following terms: ("Polycystic Ovary Syndrome") AND (Treatment OR diet OR exercise OR management) AND ("Body Composition" OR "Hormones"). Search terms were applied to title and abstract fields to prioritize studies in which the concepts of interest constituted the primary focus of the investigation. After completing the search in the three databases, duplicate records were removed and then the resulting articles were reviewed applying the eligibility criteria.

4.1. Eligibility Criteria

The inclusion criteria comprised original research articles published in English that evaluated a longitudinal diet and physical activity interventions in adult women diagnosed with PMOS, reporting at least one outcome related to body composition or hormonal variables. Eligible studies included randomized controlled trials, quasi-experimental studies, and single-arm interventional studies evaluating dietary and/or physical activity interventions in adult women diagnosed with PMOS. Studies were required to include a clearly defined PMOS diagnosis based on established criteria (e.g., NIH, Rotterdam, or AES),

although no restrictions were applied regarding the specific diagnostic framework. No minimum intervention duration was imposed; however, study length was considered during data interpretation. Exclusion criteria included narrative reviews, editorials, encyclopedias, abstracts, conference summaries, mini-reviews, animal studies, and studies involving participants with PMOS and other significant comorbid conditions that could confound the interpretation of outcomes. Studies involving pharmacological interventions as the primary treatment were also excluded.

4.2. Article Selection Process

Article selection followed the PRISMA flow diagram. A systematic search was conducted in PubMed, Web of Science, and Science Direct databases for studies published between 2015 and 2025 to capture the most recent evidence on diet and physical activity interventions in PMOS. This period was selected to reflect contemporary diagnostic approaches, lifestyle intervention strategies, and outcome assessment methods, thereby enhancing the clinical relevance and applicability of the findings. Only studies published in English were included. This restriction was applied since English represents the predominant language of scientific publication in the biomedical and health sciences literature and allowed for consistent evaluation and interpretation of the included studies. After removing duplicates, records were screened by title and abstract, and studies were excluded based on predefined criteria, including irrelevant outcomes, animal studies, study design, pharmacological or alternative treatment, ineligible population characteristics, and non-English language. Full-text articles were then assessed for eligibility. Studies were excluded if the full text was not accessible. In cases where multiple publications reported data from the same study population, only the most complete or relevant report was included to avoid duplication of data.

4.3. Data Analysis and Methodological Quality Assessment

Due to substantial heterogeneity in intervention characteristics, study designs, outcome measures, and reporting methods, a quantitative meta-analysis was not considered appropriate. Instead, a narrative synthesis was conducted by systematic review. Extracted data were grouped according to intervention type (dietary, exercise, and combined interventions) and outcome category (body composition, metabolic outcomes, and hormonal outcomes). Patterns and inconsistencies across studies were identified and summarized descriptively. When conflicting findings were reported, results were interpreted considering methodological quality, participant characteristics, intervention duration, and outcome assessment methods. No formal vote-counting approach was applied. The methodological quality was assessed using the National Institutes of Health (NIH) Quality Assessment Tool for Controlled Intervention Studies, a validated instrument designed to evaluate the internal validity and risk of bias of intervention studies. The tool consists of 14 criteria addressing key methodological domains, including randomization procedures, allocation concealment, blinding, sample size justification, adherence to interventions, outcome assessment, attrition, and statistical analyses. Each study was independently evaluated by two reviewers (M.Z.T.-V. and M.A.H.-L.). Based on the NIH guidance, studies were classified as having good, fair, or poor quality according to the overall fulfillment of the assessment criteria. Good-quality studies were considered to have a low risk of bias and valid results, fair-quality studies were susceptible to some bias but not sufficient to invalidate their findings, and poor-quality studies exhibited methodological limitations that could substantially affect the validity of their results. Any discrepancies between reviewers were resolved through discussion and consensus.

5. Conclusions

The findings of this review support the effectiveness of dietary and lifestyle interventions, as they were frequently associated with improvements in body composition and metabolic outcomes in women diagnosed with PMOS, although evidence regarding hormonal responses remains inconsistent. These improvements appear to be largely mediated by reductions in adiposity and associated metabolic adaptations, rather than by specific effects of individual interventions. In this context, energy-restricted dietary approaches and combined diet–exercise interventions seem to provide the most consistent benefits, particularly when sustained over time.

However, the marked heterogeneity in hormonal outcomes highlights the complexity of PMOS pathophysiology and suggests that responses to lifestyle interventions are likely influenced by baseline metabolic status, degree of adiposity, and underlying phenotypic variability. Therefore, future research should move beyond identifying effective interventions at a group level and focus on elucidating which patient profiles derive the greatest benefit from specific strategies. Well-designed randomized controlled trials with standardized diagnostic criteria, adequate sample sizes, and longer follow-up periods are needed to clarify the long-term effects of lifestyle interventions on endocrine regulation and reproductive function in women diagnosed with PMOS.

Supplementary Materials: The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/women6030046/s1>: Supplementary S1: PRISMA 2020 Checklist.

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