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Aerobic Exercise Impacts on Metabolic and Hormonal Profiles in PCOS Women: A Scoping Review

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Abstract

Introduction: Polycystic Ovary Syndrome (PCOS) is a complex endocrine disorder commonly linked with insulin resistance, hormonal imbalances, and metabolic dysfunction. Aerobic exercise has emerged as a promising non-pharmacological intervention in PCOS management, with potential benefits across metabolic, hormonal, and anthropometric domains. This scoping review aims to map existing evidence on the effects of aerobic exercise in women with PCOS, focusing on changes in metabolic profile (glucose-insulin regulation, lipid levels, inflammatory markers), hormonal balance, body composition, and quality of life.
Methods: A scoping review was conducted following the PRISMA-ScR guidelines. Eligible studies were peer-reviewed articles published in English between 2013 and 2023, involving women diagnosed with PCOS using established criteria (e.g., Rotterdam), and implementing aerobic exercise as the main intervention. Literature was identified through searches in PubMed, Google Scholar, Scopus, Taylor & Francis, and ProQuest. Studies reporting outcomes related to metabolic, hormonal, anthropometric parameters, and/or quality of life were included. Data were extracted manually and synthesized narratively.
Results: Most studies indicated that moderate to high-intensity aerobic exercise for at least 12 weeks improved insulin sensitivity, reduced androgen levels, and enhanced body composition. Despite variations in exercise protocols, consistent benefits were observed. However, heterogeneity in study design and duration limits cross-study comparisons.
Conclusion: Aerobic exercise is a beneficial intervention for managing PCOS, positively impacting metabolic, hormonal, and anthropometric outcomes. It is recommended as part of an individualized treatment plan. Further research is needed to define optimal exercise protocols for different PCOS phenotypes. Limitations include lack of quality assessment and language bias. Not registered.

Keywords: *Polycystic Ovary Syndrome, aerobic exercise, metabolic profile, hormonal balance, anthropometric outcomes*

Introduction

Polycystic Ovary Syndrome (PCOS) is a complex and heterogeneous endocrine disorder affecting approximately 4–20% of women of reproductive age globally,[1] with a prevalence of 4–6% in Indonesia.[2] The etiology of PCOS is multifactorial, involving genetic and epigenetic factors, diet, environmental influences, unhealthy lifestyles, exposure to carcinogenic substances, family history, and obesity.[3,4] Pathophysiologically, PCOS is characterized by hyperandrogenism, ovarian dysfunction, hypothalamic hormonal dysregulation, and insulin resistance.[5] Approximately 70% of women with PCOS remain undiagnosed.[6]

According to the Rotterdam criteria, a PCOS diagnosis is established when at least two of the following three features are present: (1) oligo- or anovulation, (2) clinical or biochemical hyperandrogenism, and (3) polycystic ovarian morphology (PCOM) confirmed by ultrasonography.[7] PCOS affects not only the reproductive system but is also associated with various clinical symptoms and metabolic complications. Common manifestations include ovarian cysts, elevated testosterone levels, irregular menstruation, hirsutism, acanthosis nigricans, and acne on the face and back due to oily skin.[6,8–10]

PCOS is also a leading cause of infertility and contributes to weight gain, obesity, metabolic syndrome (predisposing individuals to diabetes and insulin resistance), and elevated systemic inflammation. Insulin resistance in PCOS patients further contributes to hypertension, dyslipidemia, impaired glucose tolerance, and diabetes. Psychological disorders such as depression, anxiety, eating disorders, and bipolar disorder are also frequently observed in women with PCOS.[11–14]

Management of PCOS, according to the 2023 *International Evidence-Based Guideline for the Assessment and Management of Polycystic Ovary Syndrome*, is classified into conservative (non-pharmacological) and pharmacological approaches. Non-pharmacological strategies primarily involve lifestyle modifications such as behavioral interventions, dietary regulation, and increased physical activity to counter sedentary behavior. Pharmacological treatments include metformin, inositol supplements, and oral contraceptives.[15]

Physiotherapy plays a crucial role in providing exercise therapy to help alleviate PCOS symptoms. In addition to reproductive benefits, exercise has been shown to improve metabolic function, anthropometric profiles, and health-related quality of life (HRQoL). Menstrual disorders and hormonal imbalances, such as amenorrhea and dysmenorrhea, can impair concentration, reduce participation in daily activities, and lower productivity. Dysmenorrhea is caused by elevated prostaglandin levels due to estrogen-progesterone imbalance. In PCOS, this mechanism is exacerbated by hyperandrogenism and insulin resistance, further disrupting menstrual cycles.[16,17]

One of the most studied and recommended forms of physical activity is aerobic exercise, including brisk walking, jogging, and cycling.[18] These activities are essential for reducing sedentary behavior common among women with PCOS,[19,20] and they help improve metabolic disturbances when performed regularly for a minimum of 12 weeks.[18] Aerobic exercise engages large muscle groups, relies on aerobic metabolism (oxygen-based energy production), is performed at moderate intensity (60–80% of maximum heart rate), and utilizes 50–85% of maximal oxygen consumption over a sustained duration.[21,22]

A review by Woodward et al. reported that aerobic exercise can enhance insulin sensitivity, reduce hyperinsulinemia, and decrease excessive stimulation of the ovarian theca cells, leading to reduced androgen production and increased sex hormone-binding globulin (SHBG) levels.[18] These changes help normalize the LH: FSH ratio and restore GnRH sensitivity to hormonal feedback, thereby improving follicular recruitment, regulating ovulation, and enhancing reproductive function.

Given the evidence, aerobic exercise holds significant promise in the management of PCOS. However, to date, no comprehensive review has specifically synthesized the effects of aerobic exercise on the combined outcomes of metabolic, hormonal, and anthropometric parameters in women with PCOS.

Therefore, this literature review aims to map the influence of aerobic exercise on women with PCOS, particularly regarding metabolic profiles (glucose-insulin regulation, inflammatory proteins, and lipid profiles), hormonal imbalances, anthropometric characteristics, and quality of life.

Methods

This scoping review aimed to investigate the effects of aerobic exercise on metabolic profiles, hormonal imbalances, anthropometric outcomes, and quality of life in women with Polycystic Ovary Syndrome (PCOS). The review was conducted according to a predefined protocol, although this protocol was not registered in any publicly accessible database. Inclusion and exclusion criteria were developed using the PICOS framework, targeting primary studies involving women diagnosed with PCOS who underwent aerobic exercise interventions. Eligible study designs included randomized controlled trials (RCTs), quasi-experimental studies, controlled clinical trials, and comparative studies published in English or Indonesian with full-text availability. Studies incorporating pharmacological interventions, special diets, or other types of exercise as the primary treatment, or those lacking relevant outcome measures, were excluded.

Articles were included if participants were diagnosed with PCOS based on established criteria, such as the Rotterdam criteria. Interventions were required to involve aerobic exercise exclusively, and studies needed to report on at least one of the following outcomes: metabolic profile (e.g., insulin resistance, glucose metabolism), hormonal levels (e.g., testosterone, androgens), anthropometric measurements (e.g., body mass index [BMI]), or quality of life. No restrictions were imposed on the duration of the intervention or follow-up periods, provided relevant outcomes were reported.

A comprehensive literature search was performed across five electronic databases: PubMed, Google Scholar, Scopus, Taylor & Francis, and ProQuest. The search covered studies published from January 2014 to January 2024, with the most recent search conducted on January 12, 2024. The search strategy combined Medical Subject Headings (MeSH) and keywords using Boolean operators. For example, the PubMed search string was as follows: ("Polycystic Ovary Syndrome"[MeSH Terms] OR "polycystic ovary syndrome"[Title/Abstract] OR "PCOS"[Title/Abstract]) AND ("Aerobic Exercise"[MeSH Terms] OR "aerobic exercise"[Title/Abstract] OR "aerobic training"[Title/Abstract] OR "cardiorespiratory exercise"[Title/Abstract]) AND ("Insulin Resistance"[MeSH Terms] OR "insulin resistance"[Title/Abstract] OR "metabolic profile"[Title/Abstract] OR "glucose metabolism"[Title/Abstract] OR "body mass index"[Title/Abstract] OR "BMI"[Title/Abstract] OR "androgen level"[Title/Abstract] OR "testosterone level"[Title/Abstract] OR "hormonal profile"[Title/Abstract]).

Study selection was conducted independently by two reviewers who screened titles and abstracts, followed by full-text reviews of potentially eligible articles. Discrepancies were resolved through discussion or consultation with a third reviewer. A standardized data extraction form was used to collect study characteristics, including author(s), publication year, country of origin, study design, sample size, aerobic exercise intervention details (frequency, intensity, duration), assessed outcomes (such as BMI, glucose-insulin parameters, hormonal levels, and quality of life), and key findings.

Risk of bias assessment was performed using the Physiotherapy Evidence Database (PEDro) scale for randomized controlled trials and the Joanna Briggs Institute (JBI) checklist for non-randomized studies. Assessments were conducted independently by two reviewers, with disagreements resolved by consensus. As this is a scoping review, no quantitative synthesis or summary effect measures (e.g., mean differences or odds ratios) were calculated. Instead, a narrative synthesis approach was employed, grouping studies according to outcome categories to identify patterns and trends regarding the effects of aerobic exercise in women with PCOS. This review did not include additional analyses such as subgroup or sensitivity analyses, nor did it assess risk of bias across studies (e.g., publication bias or selective reporting), as these are beyond the scope of a scoping review.

Results

A comprehensive literature search initially identified 74 articles addressing exercise interventions for women with polycystic ovary syndrome (PCOS). Of these, 34 studies specifically examined aerobic exercise modalities. After a rigorous screening process—evaluating titles, abstracts, and full texts—and applying predefined inclusion and exclusion criteria, 26 studies were selected for detailed analysis. These studies were sourced from reputable databases including Google Scholar, PubMed, Scopus, Taylor & Francis, and ProQuest. The study selection process is illustrated in the PRISMA flowchart, which outlines the numbers of records identified, screened, excluded (with reasons), and included (Figure 1). Among the 26 included studies, 14 were randomized controlled trials (RCTs), while the remainder consisted of quasi-experimental designs, comparative studies, single-group trials, and pre-post intervention models. Table 1 summarizes key characteristics of these studies, including sample size, intervention details, exercise intensity and duration, frequency, study length, design, and primary outcome measures.

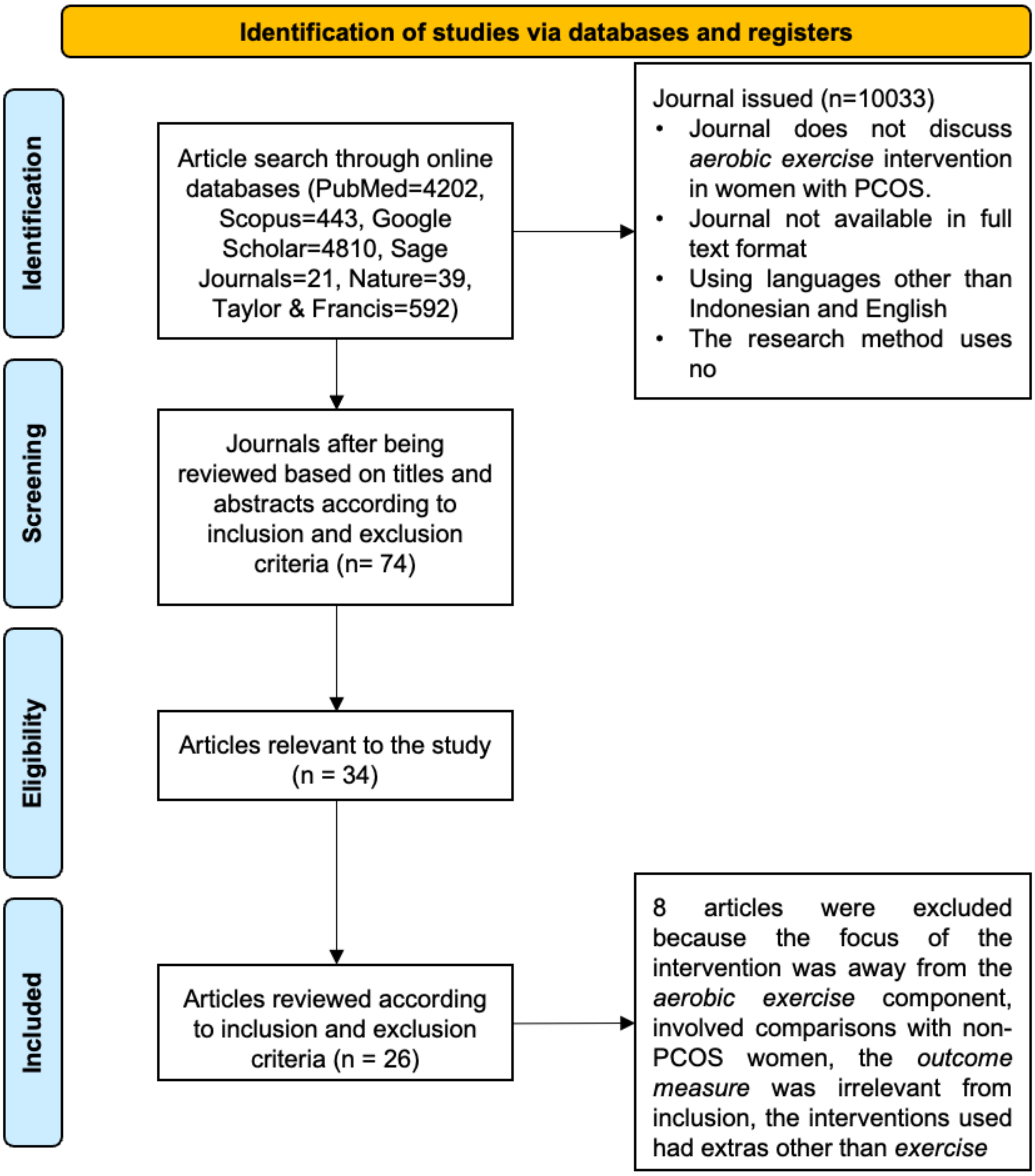

Figure 1. PRISMA flowchart

Table 1. Summary of Aerobic Exercise Intervention Studies in Women with Polycystic Ovary Syndrome (PCOS)

Author (Year, Country)	Sample Size	Intervention	Intensity	Duration (min)	Frequency (times/week)	Length (weeks)	Study Design	Primary Outcome Measures
Gwal et al. (2023, India)	60 (A=30, B=30)	Aerobic vs Resistance	Not reported	30	Not reported	8	Comparative Study	BMI, Body Shape Questionnaire
Philbois et al. (2022, Iran)	110 (3 groups)	MICT vs HIIT	HIIT: 85-90% HRR, MICT: 70-80%	MICT: 60, HIIT: 35-45	3	16	RCT	Hormones, glucose, lipids
Ribeiro et al. (2021, Brazil)	110 (3 groups)	CAT vs IAT	CAT: 65-80% HRmax, IAT: 60-90% HRmax	30-50	Not reported	16	RCT	Quality of life, hormones, ovarian morphology
Kirubamani & Abraham (2018, India)	50	Aerobic training (treadmill)	Not reported	45	5	16	Prospective Study	Reproductive health, blood pressure, lipids, quality of life
Pradhapsankar et al. (2024, India)	20	Aerobic training (jumping jack, skipping, etc.)	Not reported	40-60	3	12	Experimental Study	BMI, SF-36, menstrual cycle
Kirthika et al. (2019, India)	30 (2 groups)	Aerobic + stretching	Not reported	45	3	12	RCT	LH/FSH, testosterone, HOMA-IR, hs-CRP
Prakash et al. (2021, India)	20 (2 groups)	Aerobic vs Aerobic + Swiss ball	Not reported	60	6	12	Quasi-experimental	Body weight, abdominal fat, menstruation
Rao et al. (2021, Pakistan)	50 (2 groups)	HIIT vs Strength Training	HIIT: 90-95% HRmax	45	3	12	RCT	Testosterone, body fat
Patten et al. (2023, Australia)	29 (2 groups)	HIIT vs MICT	HIIT: 90-100% HR peak, MICT: 60-75%	HIIT: 24-48, MICT: 45	3	12	Secondary analysis RCT	Mental health, HRQoL, BMI, insulin
Benham et al. (2020, Canada)	47 (3 groups)	CAET vs HIIT	CAET: 50-60% HRR, HIIT: 90% HRR	CAET: 40, HIIT: 20	3	24	Pilot RCT	Ovulation, cycle, hirsutism, lipid profile, insulin
Kiel et al. (2022, Norway & Australia)	64 (3 groups)	HV-HIT vs LV-HIT	HV: 90-95%, LV: ~100% HRmax	HV: 38, LV: 32	3 (supervised), 48 (unsupervised)	16	Multicenter RCT	Ovulation, ovarian morphology, HOMA-IR, quality of life
Patten et al. (2022, Australia)	29 (2 groups)	HIIT vs MICT	HIIT: 90-100% HR peak, MICT: 60-75%	HIIT: 24-48, MICT: 45	3	12	RCT	Insulin, fasting glucose, body fat
Wu et al. (2021, Shanghai)	38	Aerobic training	Based on VO2AT	60	4	12	RCT	AMH, oxidative stress, reproductive hormones, lipid profile, glucose
Ribeiro et al. (2021, Brazil)	110	CAT vs IAT	CAT: 65-80% HRmax, IAT: 60-90% HRmax	30-50	3	16	3-arm RCT	Obesity index, androgen hormones, CRP, HOMA-IR, body composition
Jafari & Taghian (2020, Iran)	24	Moderate aerobic training	60–70% HRmax	60	3	12	Quasi-experimental	Glucose, insulin, IL-6, CRP, TNF-α, HOMA-IR
Kogure et al. (2019, Brazil)	110	CAT vs IAT	Same as Ribeiro et al.	30-50	3	16	Secondary analysis RCT	Body image, sexual function
Javid et al. (2019, Iran)	24	Home-based aerobic (stepping)	4–10 ExEE	20–40 (energy expenditure based)	7	16	Quasi-experimental	hs-CRP, HOMA-IR, glucose, insulin
Pandit et al. (2022, India)	60	Aerobic training	HR >120 bpm	>30	3 or 5	20	Quasi-experimental	hs-CRP, HOMA-IR, IMT, hip circumference
Lopes et al. (2018, Brazil)	110	CAT vs IAT	Same as Ribeiro et al.	30-50	3	16	Secondary analysis RCT	Sexual function

Continuation Table 1. Summary of Aerobic Exercise Intervention Studies in Women with Polycystic Ovary Syndrome (PCOS)

Author (Year, Country)	Sample Size	Intervention	Intensity	Duration (min)	Frequency (times/week)	Length (weeks)	Study Design	Primary Outcome Measures
Mohammadi et al. (2023, Iran)	30 (C=15, HIIT=15)	HIIT	100% & 50% MAV	45–65	3	8	RCT	BMI, WHR, visceral fat, body fat %, body weight, insulin, HOMA-IR, insulin sensitivity (QUICKI), LDL, HDL, cholesterol, cortisol, hs-CRP
Costa et al. (2018, Brazil)	30 (C=15, A=15)	Structured aerobic training	60–85% HRmax	40	3	16	RCT	Quality of life (SF-36), body weight, height, waist circumference, blood pressure, fasting glucose & OGTT, insulin, HOMA-IR, lipid profile, hormonal profile (FSH, LH, DHEA-S, estradiol, progesterone, testosterone), TNF-α, hs-CRP, IL-6
Abazar et al. (2013, Iran)	24 (C=12, A=12)	Aerobic training	60–70% HRmax	60	3	12	Quasi-experimental	BMI, WHR, body fat, HDL, LDL, triglycerides, cholesterol
Bonab & Parvaneh (2023, Iran)	46 (C=23, A=23)	Home-based aerobic training	60–65% HRR, 50–70% HRmax	45	3	12	Quasi-experimental	Hormones (testosterone, estrogen, prolactin), lipid profile, body weight, height, BMI
Taghavi et al. (2011, Iran)	20	Aerobic training program	Based on HRRmax	45–60	3	12	Quasi-experimental	Waist circumference, WHR, body fat %, HOMA-IR
Kordi et al. (2011, Iran)	24 (C=12, A=12)	Aerobic training (ergometer cycling)	65–70% VO_2max	30	3	12	RCT	Ovarian morphology, body fat %, waist circumference, WHR, hormones (insulin, androstenedione, testosterone, DHEA-S, SHBG)
Gaeini et al. (2013, Iran)	40	Aerobic training (running)	60–85% HRmax	25–30	3	12	Quasi-experimental	DHEA-S, 17OH-progesterone, ovarian follicle count, menstrual cycle, body weight

The study populations predominantly consisted of women aged 18 to 40 years or those who had reached menarche, with the youngest participant being 14 years old and the oldest 45 years. PCOS diagnoses were commonly established using the Rotterdam criteria or based on clinical gynaecological assessments. Body mass index (BMI) among participants varied widely; however, underweight individuals were infrequently included. The most frequently reported BMI range was 25–39.9 kg/m², with some studies including participants with BMI ≥23 kg/m² up to class II obesity (BMI 50 kg/m²). Participants were generally non-pregnant, non-smokers, and abstained from alcohol consumption. Common exclusion criteria encompassed cardiovascular disease, diabetes mellitus, thyroid dysfunction, Cushing's syndrome, hyperprolactinemia, and other endocrine disorders. Moreover, individuals who had received hormonal or other medications affecting reproductive or metabolic function prior to the intervention period were typically excluded. Most studies recruited participants who were physically inactive or did not meet recommended weekly physical activity guidelines.

Aerobic exercise was the predominant intervention in the included studies. Seven studies implemented high-intensity interval training (HIIT), characterized by brief bouts of vigorous activity alternated with recovery periods at moderate to vigorous intensity. HIIT protocols varied considerably. For example, Rao et al. employed four 4-minute intervals at 90–95% of maximum heart rate (HRmax), interspersed with 3-minute recovery periods at 70% HRmax, whereas Patten et al. utilized twelve 1-minute intervals at 90–100% of peak heart rate (HRpeak) with 1-minute recoveries, supplemented by an additional session consisting of eight 4-minute intervals with 2-minute recoveries. Other variations included low-volume HIT (LV-HIT) with ten 1-minute maximal intensity intervals and high-volume HIT (HV-HIT) with four 4-minute intervals at 90–95% HRmax, paired with 1 and 3 minutes of recovery, respectively. Another protocol consisted of 2 minutes at 85–90% heart rate reserve (HRR) followed by 3 minutes at 65–70% HRR, while a shorter-duration model comprised ten 30-second intervals at 90% HRR with 90-second low-intensity recovery periods. Mohammadi et al. applied a 30:30 second work-to-rest ratio at intensities of 100% and 50%, respectively, with 5-minute rest intervals between sets.

In addition to HIIT, some studies incorporated circuit training, such as jumping jacks, high knees, alternate side lunges, and skipping, often combined with high-intensity intervals, Swiss ball exercises, and intermittent aerobic formats. Most interventions were conducted at 60–90% HRmax intensity. A comprehensive table summarized the characteristics of each study, including author, study design, population, sample size, intervention type, primary outcomes, and follow-up duration. Control groups or alternative exercise modalities, including resistance training or combined aerobic-resistance programs, were also employed for comparative purposes. Exercise sessions typically lasted 40–45 minutes, with most interventions performed thrice weekly over 8 to 16 weeks; the most common follow-up durations were 12 and 16 weeks.

Three studies implemented home-based aerobic exercise programs, utilizing different methods to monitor exercise intensity. For instance, Pandit et al. set a heart rate threshold >120 beats per minute as the minimum intensity, whereas Javid et al. estimated exercise energy expenditure (ExEE) based on body weight maintenance and converted it to VO_2 equivalents to prescribe individualized stepping durations. While this method allowed personalization, it did not account for real-time physiological responses such as fatigue or adaptation. Conversely, Bonab and Parvaneh used heart rate reserve (HRR) guided by exercise music tempo. Notably, five studies did not report the aerobic intensity applied, including those by Gwal et al., Kirubamani and Abraham, Pradhapsankar et al., Kirthika et al., and Prakash et al.

Anthropometric outcomes were the most frequently reported, including body mass index, waist circumference, waist-hip ratio (WHR), body fat percentage, and body weight. Metabolic outcomes comprised fasting glucose, fasting insulin, insulin resistance assessed by the homeostasis model assessment (HOMA-IR), lipid profiles (total cholesterol, high-density lipoprotein [HDL], low-density lipoprotein [LDL], triglycerides), and oral glucose tolerance tests (OGTT). Hormonal parameters included total and free testosterone, luteinizing hormone (LH), follicle-stimulating hormone (FSH), LH:FSH ratio, sex hormone-binding globulin (SHBG), dehydroepiandrosterone sulfate (DHEAS), and anti-Müllerian hormone (AMH). These measures represent core indicators of the metabolic and endocrine effects of exercise interventions in PCOS. Quality of life was commonly assessed using the PCOS Questionnaire (PCOSQ) and the Short Form-36 (SF-36), each featured in three studies. Sexual function was evaluated in two studies using the Female Sexual Function Index (FSFI), while body image and self-esteem were assessed in two studies using the Body Shape Questionnaire. Psychological parameters such as depression, anxiety, and stress were examined in single studies using validated instruments including the Hospital Anxiety and Depression Scale (HADS) and the Depression Anxiety Stress Scale-21 (DASS-21), highlighting the multifaceted impact of PCOS on both physical and psychological health.

Discussion

International clinical guidelines emphasize that exercise plays a crucial role in the management of polycystic ovary syndrome (PCOS),[15] particularly in addressing the metabolic and hormonal disturbances associated with the syndrome. However, current recommendations lack specificity regarding the optimal type of exercise. Aerobic exercise has been extensively studied for its potential to improve anthropometric, metabolic, and hormonal parameters, as well as enhance quality of life in women with PCOS. This exercise modality has been shown to reduce body mass index (BMI) and waist circumference, thereby improving anthropometric profiles. Metabolically, aerobic exercise enhances insulin sensitivity, lowers homeostatic model assessment of insulin resistance (HOMA-IR), and improves lipid profiles by increasing high-density lipoprotein (HDL) levels and reducing triglycerides. Additionally, it contributes to systemic inflammation suppression by decreasing C-reactive protein (CRP) levels. Hormonally, aerobic exercise reduces free androgen concentrations, which may alleviate hyperandrogenic symptoms.[23–25] Beyond metabolic and anthropometric benefits, aerobic exercise also positively affects mental health, with the effective dose for psychological improvements generally being lower than that required for physical health benefits.[26]

Most studies included in this review are randomized controlled trials with relatively robust methodologies; however, heterogeneity in intervention protocols and follow-up durations limits the generalizability of findings. Despite consistent evidence demonstrating the beneficial effects of aerobic exercise, the overall strength of evidence varies and warrants further confirmation through studies employing standardized designs.

Consensus guidelines suggest that endurance training is superior to resistance training for improving insulin sensitivity, body composition, and cardiometabolic risk factors. Metabolic syndrome—characterized by obesity, hypertension, insulin resistance, dyslipidaemia, and hyperglycaemia—is prevalent among women with PCOS, exacerbating metabolic disturbances. Moderate-intensity aerobic exercise performed for at least 30 minutes daily can reduce metabolic syndrome risk by regulating body mass, enhancing insulin sensitivity, and lowering blood pressure and lipid levels—key factors in PCOS management. Furthermore, obese individuals, including many with PCOS, are advised to engage in weight-reducing activities such as brisk walking, cycling, or swimming, rather than high-impact weight-bearing exercises like running or plyometrics. Most reviewed studies adhered to recommended weekly exercise guidelines: 150–300 minutes of moderate-intensity or 75–150 minutes of high-intensity exercise.[15,27] Although higher exercise frequency may augment metabolic benefits, adequate recovery time (approximately 24–48 hours) remains essential.[26,28]

Four studies compared high-intensity interval training (HIIT) with moderate-intensity continuous training (MICT)/continuous aerobic exercise training (CAET). These comparisons are often confounded by differences in session duration, as HIIT typically involves shorter exercise bouts. Nevertheless, HIIT induces physiological adaptations comparable to MICT, including improvements in maximal oxygen uptake (VO_2max), fat oxidation capacity, and peripheral vascular function, despite lower total exercise volume. Both HIIT and MICT effectively reduce testosterone levels and similarly impact anthropometric, metabolic, and hormonal outcomes.[29] Thus, the relative benefits of HIIT versus MICT depend on exercise duration, intensity, and overall workload.[26,28]

In the study by Benham et al., continuous aerobic exercise was more effective at reducing BMI and increasing the probability of ovulation, although both exercise modalities significantly decreased waist circumference and improved lipid metabolism.[30] Variability in insulin sensitivity outcomes may arise from differences in intervention duration, exercise intensity, participant characteristics, lifestyle factors, and insulin resistance assessment methods (e.g., HOMA-IR versus euglycemic clamp).[29–31] Regardless, both exercise types are superior to inactivity in promoting insulin regulation among women with PCOS. Concerning hormonal parameters and quality of life, HIIT tends to be more effective than continuous exercise in improving hyperandrogenism, menstrual regularity, and psychological symptoms such as anxiety and depression.[31,32]

The shortest intervention duration among the 26 included studies was eight weeks.[33] Despite this brief period, significant improvements were observed in BMI, waist-to-hip ratio (WHR), insulin sensitivity (HOMA-IR), low-density lipoprotein (LDL), and total cholesterol—likely attributable to the very high intensity of HIIT (100–110% of Maximum Aerobic Velocity [MAV]). Rapid adaptations may be explained by increased post-exercise fat metabolism (excess post-exercise oxygen consumption [EPOC]) and more pronounced improvements in insulin sensitivity compared to moderate-intensity aerobic exercise.[34,35] However, parameters such as fasting glucose, HDL, triglycerides, and high-sensitivity CRP (hs-CRP) did not show significant changes, suggesting that some metabolic and anti-inflammatory benefits may require exercise interventions exceeding 12 weeks to become apparent.[36]

This study uniquely employed MAV, commonly used in sprint interval training or running-based HIIT, as it measures the highest aerobic speed attainable. While MAV provides a direct measure of exercise intensity, it has limitations in PCOS populations, particularly among individuals with obesity or low aerobic capacity, as it relies on speed rather than physiological markers like heart rate or VO_2max.[33]

Although VO_2max is the gold standard for assessing exercise intensity, its complexity limits practical use; thus, alternative measures such as heart rate, rating of perceived exertion (RPE), or metabolic equivalents (METs) are often utilized.[28] Among the reviewed studies, heart rate–based measures (e.g., HRmax, heart rate reserve [HRR], peak heart rate [HRpeak]) predominated, with only one study utilizing VO_2max.[37]

Aerobic exercise encompasses diverse modalities. Beyond HIIT, it may be combined with other interventions such as Swiss ball exercises. Prakash et al. demonstrated that combining aerobic exercise with Swiss ball training yielded greater reductions in body weight, abdominal fat, and menstrual irregularities than aerobic exercise alone.[38] These findings suggest that combining aerobic exercise with other modalities may potentiate benefits; however, further research is necessary to determine whether observed improvements derive from aerobic exercise itself or synergistic effects with adjunct exercises.

Home-based exercise programs also showed promise, as indicated by studies from Pandit et al. and Javid et al., which reported anti-inflammatory effects, evidenced by reductions in hs-CRP and improved insulin sensitivity. Even low-intensity exercise can yield benefits; Pandit et al. found that maintaining heart rate above 120 bpm for 30 minutes, 3–5 times weekly, produced measurable benefits by week 20.[39] Nevertheless, efficacy depends on individual capacity, and intensity estimates may be inaccurate due to variations in maximum heart rate (HRmax). Moreover, adherence and motivation factors, inconsistently monitored, could influence outcomes.

In summary, this review supports aerobic exercise as an effective non-pharmacological intervention for PCOS management, demonstrating beneficial effects on body composition, hormonal balance, metabolic regulation, and psychosocial well-being. Nonetheless, significant heterogeneity in exercise duration, intensity, and modalities underscores the need for further research using standardized protocols to identify optimal exercise regimens. Limitations include restriction to English-language publications and lack of studies conducted in Southeast Asia, limiting generalizability given potential racial, genetic, and environmental differences. Additionally, most studies did not specify PCOS phenotypes, obscuring whether aerobic exercise benefits all phenotypes equally or preferentially affects specific subtypes.

At the primary study level, some trials inadequately reported randomization or blinding procedures. Many outcomes, especially psychological and behavioral variables, relied on self-reported data, increasing the risk of reporting bias. Variability in exercise intensity assessment methods further complicates study comparisons. This review utilized narrative descriptive synthesis without meta-analysis, which limits the strength of the evidence.

Conclusion

This literature review demonstrates that aerobic exercise plays a crucial role in managing Polycystic Ovary Syndrome (PCOS), particularly by improving metabolic profiles, hormonal balance, and anthropometric parameters. Aerobic exercise enhances insulin sensitivity, reduces androgen levels, and improves reproductive function through complex physiological mechanisms. Furthermore, it contributes to lowering the risk of metabolic complications frequently associated with PCOS, including obesity, insulin resistance, and metabolic syndrome.

The majority of analyzed studies indicate that moderate-to-high-intensity aerobic exercise sustained for at least 12 weeks yields significant beneficial effects. Despite variations in exercise protocols, the primary improvements are consistently observed in metabolic and hormonal health domains. Accordingly, aerobic exercise can be recommended as a non-pharmacological intervention for PCOS management, either as a standalone treatment or combined with other therapeutic approaches. Nevertheless, further research is necessary to establish the most effective exercise protocols tailored to individual patient characteristics. Such considerations should include PCOS phenotypes, genetic predispositions, and psychological factors such as patient motivation, which may influence the efficacy of aerobic interventions.

These findings align with international clinical guidelines endorsing physical exercise as an integral component of PCOS management. Several studies reviewed herein further support the inclusion of aerobic exercise to address both metabolic and reproductive dysfunctions associated with the disorder. However, variability in individual responses underscores the need for personalized exercise prescriptions. A multidisciplinary approach is therefore recommended, integrating aerobic exercise with lifestyle modifications, such as dietary improvements, and pharmacological treatments when appropriate, to optimize clinical outcomes.

Future research should prioritize direct comparisons across different PCOS phenotypes, validate feasible and accurate exercise intensity monitoring methods suitable for populations with low aerobic capacity, and conduct studies within developing countries, including Indonesia, to assess how racial, cultural, and environmental factors may affect the effectiveness and adherence to exercise interventions.

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References

1. Misra R. PCOS (Polycystic ovarian syndrome). Agrigate Mag. 2022;02(12):177–80.
2. Hestiantoro A, Pamungkas DT. Assessment of the quality of internet-based health information in the Indonesian language about polycystic ovarian syndrome. Indones J Obstet Gynecol. 2020;8(4):222–7.
3. Krishna D. Polycystic ovary syndrome. In: Principles and Practice of Assisted Reproductive Technology. Jaypee Brothers Medical Publishers Ltd; 2019. p. 479–521.
4. Chaudhuri A. Polycystic ovary syndrome: causes, symptoms, pathophysiology, and remedies. Obes Med. 2023;39.
5. Harada M. Pathophysiology of polycystic ovary syndrome revisited: current understanding and perspectives regarding future research. Reprod Med Biol. 2022;21(1):1–13.
6. Mukerjee N. Polycystic ovary syndrome (PCOS) symptoms, causes & treatments - a review. Int J Sci Res (IJSR). 2020;9(7):1949–57.
7. Rotterdam ESHRE/ASRM-sponsored PCOS consensus workshop group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. Fertil Steril. 2004;81 Suppl 1:S19–25.
8. Wijayanti A, Rahayuningsih FB. Faktor risiko diabetes gestasional pada ibu hamil di RSUD. Jurnal Ners Universitas Pahlawan. 2025;9(2):1819–28.
9. West S, Lashen H, Bloigu A, Franks S, Puukka K, Ruokonen A, et al. Irregular menstruation and hyperandrogenaemia in adolescence are associated with polycystic ovary syndrome and infertility in later life: Northern Finland Birth Cohort 1986 study. Hum Reprod. 2014;29(10):2339–51.
10. Siregar EDU, Ramona F, Dewi LM. Hubungan antara kelainan siklus menstruasi dengan kejadian akne vulgaris pada santriwati SMA Islam Terpadu Nur Hidayah Kartasura. Biomedika. 2017;8(2).
11. Sabiti FB, Sa'dyah NAC, Puspitaningrum AP. Kepatuhan penggunaan obat terhadap profil lipid dan lingkar perut pada pasien sindrom metabolik di rumah sakit di Semarang. Pharmacon J Farmasi Indones. 2021;18(2):187–93.
12. Rini S. Sindrom metabolik. J Majority. 2015;4(4):88–93.
13. Pate KA, Sirmans SM. Epidemiology, diagnosis, and management of polycystic ovary syndrome. Clin Epidemiol. 2014;6:1–13.
14. Zahra AT, Saleh MI, Hafy Z, Effendi Y, Maritska Z, Liberty IA. Decreased sex hormone-binding globulin (SHBG) serum level in polycystic ovarian syndrome patients (PCOS). Biomedika. 2023;15(1):13–7.
15. Teede H, Tay CT, Laven JSE, Dokras A, Moran LJ, Piltonen T. International evidence-based guideline for the assessment and management of polycystic ovary syndrome 2023. Melbourne (Australia): Monash University; 2023 Feb 2.
16. Wahyuni W, Nordin NAM, Mutalazimah M. The correlation between pain's level of dysmenorrhea and affected activity: a study of young women in Surakarta residency. J Med Chem Sci. 2021;4(2):207–14.
17. Li X, Yang D, Pan P, Azziz R, Yang D, Cheng Y, et al. The degree of menstrual disturbance is associated with the severity of insulin resistance in PCOS. Front Endocrinol (Lausanne). 2022;13:1–8.
18. Woodward A, Broom D, Klonizakis M. Exercise and polycystic ovary syndrome. In: Xiao J, editor. Advances in Experimental Medicine and Biology: Physical Exercise for Human Health. Singapore: Springer Nature; 2020. p. 123–36.
19. PradhapSankar V, Abraham MM, Sneha S. Effect of aerobic exercise training on body mass index and quality of life in adult obese women with polycystic ovary syndrome. Int J Health Sci Res. 2024;14(4):49–53.
20. Butt MS, Saleem J, Zakar R, Aiman S, Khan MZ, Fischer F. Benefits of physical activity on reproductive health functions among polycystic ovarian syndrome women: a systematic review. BMC Public Health. 2023;23(1):1–9.
21. Hita IPAD. Efektivitas metode latihan aerobik dan anaerobik untuk menurunkan tingkat overweight dan obesitas. J Penjakora. 2020;7(2):135.
22. Pahlawi R, Nusaibah Y, Djawas FA, Noviana M. Aerobic exercise to reduce insulin resistance and hyperandrogenism in women with polycystic ovary syndrome. Atlantis Press SARL. 2023;p. 210–23.
23. Hafizi Moori M, Nosratabadi S, Yazdi N, Kasraei R, Abbasi Senjedary Z, Hatami R. The effect of exercise on inflammatory markers in PCOS women: a systematic review and meta-analysis of randomized trials. Int J Clin Pract. 2023;2023:1–9.
24. Kelly dos Santos I, Ashe MC, Cobucci RN, Soares GM, de Oliveira Maranhão TM, Dantas PMS. The effect of exercise as an intervention for women with polycystic ovary syndrome: a systematic review and meta-analysis. Medicine (Baltimore). 2020;99(16):e19644.
25. Patten RK, Boyle RA, Moholdt T, Kiel I, Hopkins WG, Harrison CL, et al. Exercise interventions in polycystic ovary syndrome: a systematic review and meta-analysis. Front Physiol. 2020;11:July.
26. Kramer A. An overview of the beneficial effects of exercise on health and performance. In: Xiao J, editor. Advances in Experimental Medicine and Biology: Physical Exercise for Human Health. Singapore: Springer Nature; 2020. p. 3–21.
27. American College of Sports Medicine. ACSM's guidelines for exercise testing and prescription. 11th ed. Liguori G, editor. Philadelphia: Wolters Kluwer; 2021.
28. Ketelhut S, Ketelhut RG. Type of exercise training and training methods. In: Xiao J, editor. Advances in Experimental Medicine and Biology: Physical Exercise for Human Health. Singapore: Springer Nature; 2020. p. 25–43.

29. Philbois SV, Ribeiro VB, Tank J, Reis RM, Gerlach DA, Souza HCD. Cardiovascular autonomic modulation differences between moderate-intensity continuous and high-intensity interval aerobic training in women with PCOS: a randomized trial. Front Endocrinol (Lausanne). 2022;13:1–12.
30. Benham JL, Booth JE, Corenblum B, Doucette S, Friedenreich CM, Rabi DM, et al. Exercise training and reproductive outcomes in women with polycystic ovary syndrome: a pilot randomized controlled trial. Clin Endocrinol (Oxf). 2021;95(2):332–43.
31. Patten RK, McIlvenna LC, Levinger I, Garnham AP, Shorakae S, Parker AG, et al. High-intensity training elicits greater improvements in cardio-metabolic and reproductive outcomes than moderate-intensity training in women with polycystic ovary syndrome: a randomized clinical trial. Hum Reprod. 2022;37(5):1018–29.
32. Patten RK, McIlvenna LC, Moreno Asso A, Hiam D, Stepto NK, Rosenbaum S, et al. Efficacy of high intensity interval training for improving mental health and health related quality of life in women with polycystic ovary syndrome. Nat Portfolio. 2023.
33. Mohammadi S, Monazzami A, Alavimilani S. Effects of eight-week high-intensity interval training on some metabolic, hormonal and cardiovascular indices in women with PCOS: a randomized controlled trial. BMC Sports Sci Med Rehabil. 2023;15(1):1–11.
34. Jiang L, Zhang Y, Wang Z, Wang Y. Acute interval running induces greater excess post-exercise oxygen consumption and lipid oxidation than isocaloric continuous running in men with obesity. Sci Rep. 2024;14(1):1–9.
35. Song X, Cui X, Su W, Shang X, Tao M, Wang J, et al. Comparative effects of high-intensity interval training and moderate-intensity continuous training on weight and metabolic health in college students with obesity. Sci Rep. 2024;14(1):1–13.
36. Stewart LK, Earnest CP, Blair SN, Church TS. Effects of different doses of physical activity on C-reactive protein among women. Med Sci Sports Exerc. 2010 Apr;42(4):701–7.
37. Kordi MR, Motie Z, Amirsasan R, Letafatkar A. Effects of aerobic training on clinical symptoms and biochemical parameters in women with polycystic ovarian syndrome. 2011;1(4):1–5.
38. Prakash J, James TT, Sivakumar S, Dharini S. Effectiveness of swiss ball exercises along with aerobic exercises among college girls with polycystic ovarian syndrome. J Urol Nephrol Hepatol Sci. 2021;4:34–7.
39. Pandit U, Singh M, Ranjan R, Gupta V. The effect of exercise training on body composition, insulin resistance and high sensitivity C-reactive protein (hs-CRP) in women with polycystic ovary syndrome: a pilot study from North India. Cureus. 2022;14(4).