Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 8 (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Impact Of Aerobic Exercise On Reduction Of Symptoms Of Polycystic Ovarian Syndrome Among Young Women With PCOS

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Cite this paper as: Bhavana Bansal, prof.(Dr.) Vikas choudhary, (2025) Impact Of Aerobic Exercise On Reduction Of Symptoms Of Polycystic Ovarian Syndrome Among Young Women With PCOS. *Journal of Neonatal Surgery*, 14 (8), 746-756

ABSTRACT

Background: In young women, polycystic ovary syndrome (PCOS) is prevalent; the condition affects metabolic balance, causes abnormal menstrual cycles, and increases androgenism, all of which have a negative effect on quality of life. A promising non-pharmacological strategy for the relief of polycystic ovary syndrome (PCOS) symptoms is aerobic exercise.

Objective: The goals of this research were to determine the pre-intervention health status of PCOS in young women, design an individualised aerobic exercise program, and then measure the results in terms of symptom reduction.

Methods: Forty women, diagnosed with polycystic ovary syndrome (PCOS) according to the Rotterdam criteria, between the ages of 16 to 27 participated in a pre-post intervention trial. At baseline, we measured demographics information by, information sheet. We also looked for clinical signs such as irregular periods, body mass index, waist hip ratio and hirsutism. Using paired t-tests ($p < 0.05$), data from before and after the 12-week aerobic exercise program (3-5 sessions/week, 30-45 minutes, moderate intensity) were compared.

Results: post-intervention improvements were noted in menstrual regularity,BMI, WHR and Hirsutism (as measured by the Modified Ferriman-Gallwey score) .

Conclusion: The 12-week aerobic exercise program's effectiveness as a non-pharmacological approach to PCOS care was shown by the substantial reduction of symptoms experienced by young women with PCOS. More research is needed to determine the potential advantages and wider use of this program.

Keywords: *Polycystic Ovarian Syndrome, aerobic exercise, menstrual irregularities, BMI, WHR, Hirsutism, young women, intervention study.*

1. INTRODUCTION

A significant number of reproductive-aged women are impacted by the complicated and prevalent Polycystic Ovary Syndrome (PCOS) [1]. This condition is associated with a substantial burden of illness in cardio-metabolic and reproductive health. Hyperandrogenism, ovulatory dysfunction, and polycystic ovary shape are symptoms of polycystic ovarian syndrome (PCOS), however insulin resistance is not explicitly included in the diagnostic criteria for PCOS. Insulin resistance is thought to be a primary aetiological component that exacerbates these symptoms [2-4]. The most common cause of anovulatory infertility in women of childbearing age is polycystic ovarian syndrome (PCOS) [4]. “Polycystic ovarian syndrome (PCOS) is an additional risk factor for insulin resistance, obesity, and type 2 diabetes [5-8]; polycystic ovarian syndrome (PCOS) is associated with a decline in health-related quality of life, elevated anxiety, and depression over the long run [9]; The mental health of people with chronic diseases may suffer as a result of the degradation of their quality of life and the aggravation of a variety of psychological symptoms [9–11].” Mood problems and mental health difficulties are more common among women with polycystic ovarian syndrome (PCOS) compared to those without the condition, which is not unexpected considering the symptoms of PCOS [12]. “Polycystic ovarian syndrome (PCOS) women had worse mental health and health-related quality of life compared to control women of the same age and weight [13, 14] and women with other chronic illnesses and conditions, such as diabetes and coronary heart disease [15].” Anxiety and sadness are more common among these.

women. These women may have mental health issues due to reproductive concerns, issues with body image, low self-esteem, and the disease itself [16]. “Also, the symptoms of polycystic ovarian syndrome (PCOS) may be rather disabling and bring to a decline in quality of life [17]; When it comes to gauging health-related quality of life, the Polycystic Ovary Syndrome Questionnaire (PCOSQ) is a dependable tool for women who suffer from PCOS [17].” Among otherwise healthy people, regular exercise has been

. associated with better mental health [18]. Overweight women are no exception to this rule, as are populations afflicted by chronic diseases [19, 20]. “Based on the little studies on the issue, exercise has the potential to enhance the mental well-being and health-related quality of life of women with polycystic ovary syndrome (PCOS) [21–24]; Women with polycystic ovary syndrome who engage in regular physical activity are less likely to have depressive symptoms than those who do not [9]; In contrast, women with active polycystic ovary syndrome are more likely to report symptoms of depression compared to individuals without PCOS [9]; Global consensus on the diagnosis and treatment of polycystic ovarian syndrome (PCOS) now calls for 150 minutes of moderate-intensity exercise per week or 75 minutes of vigorous-intensity exercise per week”. Their general well-being and standard of living will be enhanced as a result. “Insulin sensitivity, cardiorespiratory fitness, menstrual cyclicity, and mental health are some of the many well-documented health benefits of exercise [21, 22, 25, 26]”. Even though exercise has many positive effects, many women with polycystic ovarian syndrome (PCOS) either don't exercise regularly or at all, or exercise less than recommended, because they don't comply with these standards and because there are general and PCOS-specific obstacles to exercise [27]. Enhancing exercise engagement is crucial for two reasons: first, to increase the likelihood that people will follow exercise recommendations, and second, to enhance the potential beneficial impacts of exercise on physical and mental health [16]. “By synthesising the available data, this systematic review aims to determine if exercise aids women with polycystic ovarian syndrome (PCOS) in managing their mental health symptoms and health-related quality of life.”

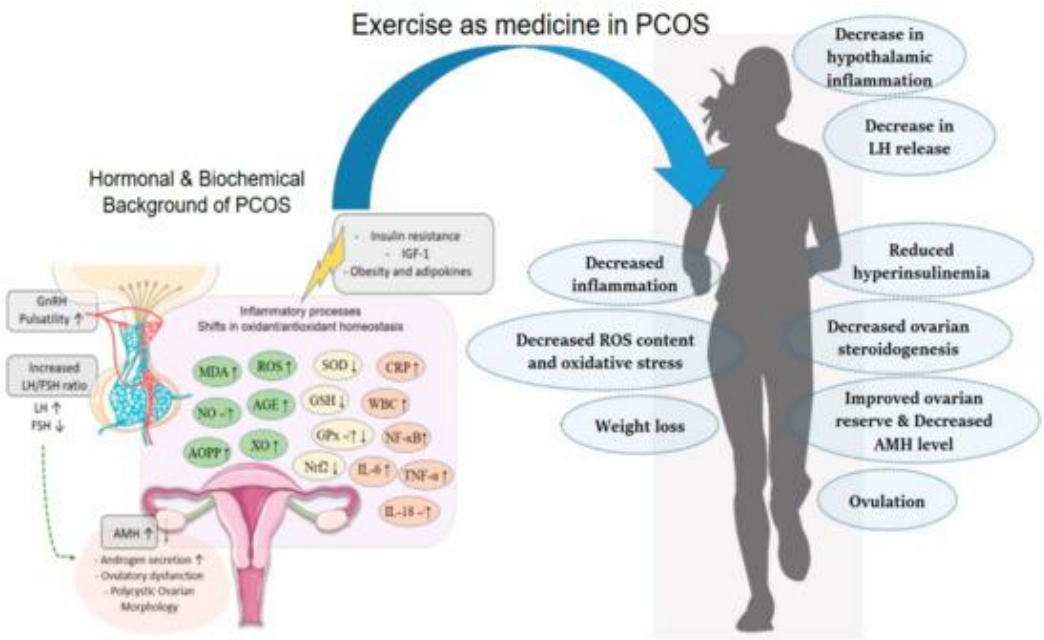

Figure 1. Exercise creates a normo-androgenic state by reducing oxidative and inflammatory stress markers in polycystic ovary syndrome (PCOS) women. In this context, "GnRH," "LH," "FSH," "AMH," "MDA," "NO," and "ROS" refer to nitric oxide, luteinizing hormone, follicle-stimulating hormone, anti-Müllerian hormone, and malondialdehyde, respectively. A.O.P. stands for advanced oxidation protein product, while AGE stands for advanced glycosylated end product. A superoxide dismutase (SOD) and a xanthine oxidase (XO) enzyme Glutathione peroxidase, or GSH, is an enzyme White blood cell, C-reactive protein, nuclear factor erythroid 2-related factor 2, and Nrf2 are all acronyms for "reactive protein." “ Insulin-like growth factor-1 (IGF-1), tumour necrosis factor-alpha (TNF-α), nuclear factor-kappa B (NF-κB), and interleukin-6 (IL-6) and interleukin-18 (IL-18) are all acronyms for the same protein.”

2. OBJECTIVES

To assess the baseline health status of young women with PCOS.

To implement an aerobic exercise intervention program tailored for young women diagnosed with PCOS.

To assess the impact of aerobic exercise on the reduction of symptoms of polycystic ovarian syndrome among young women with PCOS.

3. LITERATURE REVIEW

The mental well-being and overall contentment of women impacted by polycystic ovarian syndrome (PCOS) are profoundly impacted by the condition, in addition to its medical symptoms. “The study found that compared to women overall, PCOS women had a higher prevalence of anxiety and depression”. The inability to establish or maintain personal relationships, changes in body image, anxieties of parenthood, menstrual cycle abnormalities, and other similar issues may be causing individuals mental distress [28]. Women with polycystic ovarian syndrome (PCOS) face discrimination and stigma due to the condition's impact on their reproductive health and how they look. Feelings of guilt, isolation, and humiliation may accompany polycystic ovary syndrome (PCOS) symptoms in societies that value virility and physical attractiveness highly [29]. “Negative social assessments may cause psychological trauma by interfering with social interactions, relationships, and overall social functioning, Unfavourable societal evaluations may have a detrimental influence on social interactions, relationships, and overall social functioning, which can lead to psychological trauma [30].”

Mood problems may be triggered by insulin resistance and hormonal irregularities related to polycystic ovary syndrome (PCOS) [31]. “These issues might exacerbate preexisting mental diseases. Due to the interaction between hormonal changes and neurotransmitter abnormalities, women with polycystic ovarian syndrome (PCOS) may encounter emotional dysregulation [32]; The devastating psychological effects of polycystic ovarian syndrome (PCOS) have a significant impact on the daily lives of affected women, making it difficult for them to maintain relationships, succeed in school or the workplace, and carry out routine tasks [33].” Polycystic ovarian syndrome (PCOS) has far-reaching consequences for both physical and emotional health, making it all the more important to develop effective treatments. Exercising in addition to other treatments for PCOS control has various benefits. Studies have shown that regular exercise may regulate menstrual cycles, improve insulin sensitivity, and aid in weight loss [34]. Furthermore, exercise has a positive influence on hormonal profiles; this suggests that it may reduce androgen levels and maybe help with the hormonal imbalances that accompany the disease. This evidence-based research found that exercise may help manage PCOS and its associated health issues to a greater extent than other methods [35]. “Importantly, several studies have shown that exercise improves mental health and reduces psychological discomfort [36]”. Women with polycystic ovarian syndrome (PCOS) may find relief from both their physical and mental problems with regular exercise. It may lessen physical symptoms, but it could also boost emotional resilience and quality of life [35]. “The benefits of aerobic exercise and high-intensity resistance training have been researched extensively, which is why both exercise routines are popular.” By targeting certain muscle regions with external resistance—like weights or resistance bands—high-intensity resistance training improves strength, muscular growth, and endurance [36]. On the other hand, aerobic exercise involves doing things that make your heart rate and breathing rate higher in order to build endurance and cardiovascular fitness [37]. Various fitness regimens have the potential to impact people's mental and physiological health [38].

4. METHODS

1. Study Design

This study utilizes a pre-post intervention design to evaluate the effectiveness of a 12-week aerobic exercise program in reducing symptoms of Polycystic Ovarian Syndrome (PCOS) among young women. The design includes baseline assessments to establish participants’ health status, implementation of a structured aerobic exercise intervention, and post-intervention assessments to measure changes in PCOS symptoms. The study employs both descriptive and inferential statistical analyses to assess outcomes.

2. Participants

Forty women between the ages of 16 and 27 are part of the study that uses the Rotterdam criteria for a diagnosis of polycystic ovarian syndrome (PCOS). “These criteria include: at least two of the following: oligo/anovulation, hyperandrogenism (clinical or biochemical), and ultrasound-confirmed polycystic ovaries.” Community health facilities, gynaecological clinics, and POS support groups in the area are sources for the research participants.

Inclusion Criteria

Women between the ages of 16 and 27 who had a verified diagnosis of polycystic ovary syndrome. People who were either very sedentary or did not exercise much (less than 150 minutes of moderate aerobic activity per week) before enrolling.

Dedication to an aerobic fitness regimen for a full twelve weeks.

Exclusion Criteria

Presence of other endocrine disorders (e.g., thyroid dysfunction, Cushing’s syndrome) that could confound results.

Current pregnancy or plans to conceive during the study period.

Medical conditions or physical limitations contraindicating aerobic exercise, such as severe cardiovascular disease or musculoskeletal injuries.

Sampling

Participants are selected using a purposive sampling technique to ensure eligibility based on inclusion and exclusion criteria. Screening is conducted through medical record reviews and consultations with healthcare providers to confirm PCOS diagnosis and suitability for exercise. A total of 40 eligible participants are enrolled.

3. Study Protocol

Baseline Assessment

Data Collection Tools:

Demographic variables:-The demographic information are collected using a structured questionnaire. Demographic information includes age, qualification, lifestyle pattern, area of residence, marital status, family history of PCOS, age at menarche, and duration of diagnosis.

PCOS Symptom Evaluation: BMI , HIP WAIST RATIO are measured by the researcher For hirsutism, there is the Modified Ferriman-Gallwey score; and for ovulation, there is the menstrual cycle diary;

Procedure: Baseline assessments are conducted by researchers in a clinical setting.

5. INTERVENTION

Program Design:

Duration and Frequency: A 12-week aerobic exercise program with three to five 30- to 45-minute sessions each week constitutes the intervention.

Exercise Type: Moderate-intensity aerobic activities, such as **Delivery**: Sessions are led by certified fitness trainers in group settings at community centers or gyms to foster motivation and adherence. Virtual sessions via video platforms are offered for accessibility.

Educational Component: To enhance engagement and understanding, participants attend an initial workshop and receive informational materials on PCOS and the benefits of aerobic exercise.

Compliance Monitoring: Participants maintain daily exercise logs to record session duration, type, and perceived exertion. Weekly check-ins with researchers address barriers to participation, and attendance is tracked to ensure at least 80% adherence.

Post-Intervention Assessment

Data Collection: The same tools used at baseline (Modified Ferriman-Gallwey score, menstrual cycle diaries,) are administered after 12 week of completing the intervention. BMI and WHR are re-measured to assess physical changes.

Procedure: To minimize variability, post-intervention assessments are conducted under conditions identical to baseline.

Data Analysis

Descriptive Statistics: The given document summarises demographic and clinical information using statistics such as means, standard deviations, percentages, and distributions .

Inferential Statistics: At a significance threshold of $p < 0.05$, paired t-tests are used to assess PCOS symptom before and after the intervention.

Software: Statistical analysis is performed using SPSS or a similar software package.

Ethical Considerations

Informed Consent: Subjects provide their written informed permission after being apprised of the study's goals, methods, potential hazards, and advantages.

Confidentiality: Data are anonymized using unique participant identifiers, and access is restricted to the research team. All data are stored securely in compliance with data protection regulations.

Ethical Approval: An institutional ethics committee has reviewed and approved the research protocol to guarantee it follows all applicable ethical guidelines.

Safety: Medical clearance is obtained for all participants prior to enrolment. The exercise program is designed to minimize risks, with trainers trained to recognize and respond to adverse events. Medical support is available during sessions if needed.

6. RESULTS

Analysis and interpretation of data:

The collected data were analyzed in terms of both descriptive and inferential statistics.

Table 1: Section 1: Analysis of sample characteristics

1	**Age in years**		
		Frequency	Percentage
A	16-18years	10	25.0
B	19-21years	13	32.5
C	22-24 years	11	27.5
D	25-27years	6	15.0
		40	100
2	**Qualification**		
		Frequency	Percentage
A	Primary	9	22.5
B	High school	7	17.5
C	Higher secondary	13	32.5
D	Degree and above	11	27.5
		40	100
3	**Lifestyle**		
		Frequency	Percentage
A	Sedentary	21	52.5
B	moderate	13	32.5
C	healthy	6	15.0
		40	100
4	**RESIDENCE**		
		Frequency	Percentage
A	**Urban**	24	60.0
B	**Rural**	16	40.0
		40	100
5	**Age at Menarche**		
		Frequency	Percentage
A	10or below	10	25.0
B	11-12years	13	32.5
C	13-14 years	11	27.5
D	15 or above	6	15.0
		40	100

6	**Marital status**		
		Frequency	Percentage
A	Unmarried	10	25.0
B	Married	19	47.5
C	Separated or divorce	11	27.5
		40	100
7	**family history of PCOS**		
		Frequency	Percentage
A	Yes	21	52.5
B	No	19	47.5
		40	100
8	**Type of family**		
		Frequency	Percentage
A	Nuclear	12	30.0
B	Joint	17	42.5
C	Extended	11	27.5
		40	100
9	**Duration of diagnosis of pcos**		
		Frequency	Percentage
A	Newly diagnosed	10	25.0
B	With in a year	14	35.0
C	1-3 years	9	22.5
D	3-5 years	7	17.5
		40	100.0

Hence it was concluded that out of 40 respondents, 32.5% were in the age group 19-21 years, 27.5 % were in the age group of 16- 18 years and 25% were in the age group of 16-18 years and only 15 % respondents were in the age of 25-27years . According to qualification 32.5% were in higher secondary, 22.5 % were Primary, 17.5 % were high school, and 15% were Ph.D. According to life syle 52.5% respondents had living sedentary, 32.5% moderate and 15% were healthy life syle..according to residence 40% lived in rural area and 60% lived in urban area. According to age of menarche 32.5% in 11 to 12 years , 27.55 in 13 to 14 years ,25% in 10 or below 10 age group and 155 in 15 or above 15 age group. According to marrital status 47.5% women maerried, 27.5% separared or divorce and 25% were unmarried.according to family history of pcos 52.55 women have a family history but47.5% womeb have not a family history. According to type of family 42.5% women were lived in a joint family, 30% women were in a nuclear family and only 27.5% were lived in extended family. according to duration of diagnosis of pcos 35% women were with in a year , 25% were newly diagnosed , 22.5% women were 1 -3 years and 17.5% were 3 - 5 years.

Table 2: Section II: Evaluate the effectiveness of the aerobic exercise on symptoms of pcos by comparing pre- and post-test mean

									t	df	Sig.

											(2-tailed)
Paired Samples Statistics						Mean	Std. Deviation	Std. Error Mean			
		Mean	N	Std. Deviation	Std. Error Mean						
Pair 1	Menstrualcycle pattern(1-4) PRE	2.63	40	1.030	.163	1.250	.927	.147	8.530	39	.000
	Post	1.38	40	.586	.093						
Pair 2	BMI(1-4) PRE	2.58	40	1.035	.164	1.025	1.000	.158	6.485	39	.000
	POST	1.55	40	.639	.101	.925	.829	.131	7.061	39	.000
Pair 3	WHR(1-3)PRE	2.23	40	.733	.116	.925	.829	.131	7.061	39	.000
	POST	1.30	40	.516	.082						
Pair 4	Galwayscore)1-9 PRE	2.93	40	.859	.136	1.375	.774	.122	11.233	39	.000
	POST	1.55	40	.639	.101						

Table shows the comparison of the pretest and post test values of all the four symptoms of pcos I.e menstrual cycle pattern, BMI, WHR, and hirsutism in the study group. There is significant decrease from the pretest to post test values of menstrual cycle pattern ($p<.001$) , BMI($p<.001$), WHR ($p<.001$) , and hirsutism ($p<.001$).

Hence the interventions have significantly reduced the symptoms of pcos among the women with pcos.

7. DISCUSSION

Current worldwide evidence-based recommendations [39] and meta-analyses [40] recently conducted in this group of women identify knowledge gaps that are aligned with this comprehensive review of exercise therapies. In women who suffer from polycystic ovary syndrome, there is strong evidence that aerobic exercise training may improve some health outcomes. In instance, it has been regularly seen that aerobic exercise, regardless of intensity, improves VO2peak in PCOS women [41]. One key indication of health and mortality is VO2peak, which is a measure of cardiorespiratory fitness [42]. Cardiorespiratory fitness, rather than body mass index (BMI), is the strongest predictor of mortality risk, and those with lower VO2peak are more likely to die prematurely or suffer from serious illnesses [43]. "To back this up, there is a 13% decrease in the risk of all-cause mortality for every 3.5 mL/kg/min rise in VO2peak [44]; After 30 hours of vigourous intensity exercise over 10 to 12 weeks, regardless of dietary interventions, women with polycystic ovary syndrome (PCOS) and a relatively low VO2peak of 24 mL/kg/min are expected to have a 30% reduced risk of all-cause death, according to our meta-analysis." For women with high baseline levels of VO2peak, increasing the intensity of exercise becomes crucial for improving the parameter. The findings emphasise the significance of exercise intensity when recommending exercise programmes in clinical practice or during clinical trials, building on previous research that has shown increases in VO2peak after treatments including vigourous or high-intensity exercise [45].

A recent meta-analysis found that 61% of women with polycystic ovary syndrome are overweight or obese [46]. So, it should come as no surprise that numerous programmes including food and exercise attempt to lower body mass index (BMI). "Weight reduction of 5-10% is recommended for overweight women with polycystic ovary syndrome (PCOS) in order to achieve clinical improvements [39]; Health advantages may still happen even if you don't lose a lot of weight [47]." It is not unexpected that our research did not show any improvement in body mass index (BMI) after an exercise-only intervention. Small but noticeable reductions in body mass index (BMI) are possible when physical activity is paired with dietary changes. We also found that dietary changes were associated with better WC. After 20 weeks, three treatment groups (diet alone, diet + aerobic activity, and diet + combined aerobic and resistance exercise) showed ~10% decreases in body weight and waist circumference, according to research by Thomson et al. [48]. Nutritional advice, aerobic exercise, and strength training were not associated with statistically significant changes in body weight or body mass index (BMI) in a research by Bruner et al.

[49]. Nonetheless, after the intervention period, they found that both groups' waist circumferences had decreased by 5%. Many people believe that the body mass index (BMI) isn't the best indicator of obesity since it doesn't always capture changes in actual body fat percentage [50]. "Changes in body composition may be better understood with the use of direct techniques for evaluation, such as dual-energy X-ray absorptiometry (DXA); In the absence of DXA data, WC measurements may provide a more accurate assessment of the health risks associated with obesity than BMI [51]." There may be no change in total body weight as a result of exercise training alone, but there may be improvements in other measures of body composition, such as waist circumference, such as increased lean mass and reduced fat mass.

Figure 2: benefits of exercise in PCOS

The metabolic dysfunction seen in PCOS women is supported by insulin resistance, a critical aetiological aspect of the condition [52]. Insulin clamp testing shows that 56% to 95% of PCOS women have insulin resistance, which is not yet part of the diagnostic criteria [53]. For this reason, before serious consequences arise, it is crucial to learn how different types and intensities of exercise interact with food in order to discover exercise treatments that effectively reduce insulin resistance in PCOS women. People with diabetes may improve their insulin sensitivity with resistance exercise [54]. But there isn't a tonne of proof that this kind of training helps PCOS patients [48]. Compared to a control group, we found that resistance training treatments resulted in modest reductions in HOMA-IR. "Our present understanding of the potential benefits of resistance training for polycystic ovary syndrome (PCOS) is based on a small number of researches with very small sample sizes." Some research suggests that women with polycystic ovary syndrome (PCOS) may benefit from resistance exercise, which has been shown to increase insulin sensitivity in diabetics. In addition, our meta-analysis shown that HOMA-IR levels in PCOS women decreased somewhat with vigourous intensity aerobic exercise. Several additional clinical populations have found the same thing [55]. Research by Greenwood et al. [56] found that women with polycystic ovary syndrome (PCOS) benefited more from vigourous exercise than moderate exercise for their health. They found that the risk of metabolic syndrome decreased by 22% in those who exercised vigorously for 60 minutes each week. "Harrison et al [57] also discovered that following 12 weeks of vigourous intensity exercise intervention, insulin sensitivity in PCOS women increased by 16% utilising the gold-standard euglycaemic-hyperinsulinaemic clamp approach [58]." It should be mentioned that HOMA-IR does have a few limitations, namely a low sensitivity for IR detection and the fact that using the clamp method in real-world clinical settings is not feasible [53]. "Despite their limitation, the HOMA-IR is stills the gold standard for insulin resistance testing in polycystic ovarian syndrome (PCOS) clinical trials due to its low cost and ease of translation into clinical practice."

8. CONCLUSION

This study adds to what is already known about the advantages of exercise prescription for PCOS patients and builds on prior research. "Our results show that exercise training improves cardio-metabolic outcomes in PCOS women, regardless of whether there are anthropometric alterations or not". This suggests that exercise treatment should be the first line of defence in improving PCOS women's health. "Menstrual abnormalities, body mass index (BMI), waist-hip ratio (WHR), and hirsutism are some of the PCOS symptoms that this research shows may be greatly alleviated by a 12-week aerobic exercise programme of moderate intensity." As a non-pharmacological, cost-effective method to enhance reproductive, metabolic, and clinical outcomes, these results lend credence to the idea that aerobic exercise should be a part of regular PCOS treatment. To validate these advantages, investigate psychological effects, and optimise exercise regimens for varied PCOS groups, future research should focus on bigger, longterm studies

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