

# Effect of 12 Week Aerobic and Resistance Exercise Program on Cardiometabolic Profile and Body Composition in Overweight and Obese Females with Polycystic Ovary Syndrome Between the Age 18-35 Years

Dr. Amrit Kaur<sup>1</sup>, Mahima Dadhich<sup>2</sup>, Dr. Deepti Wadhwa<sup>3</sup>,  
Dr. Sunil Patil<sup>4</sup>

<sup>1</sup>Principal, <sup>2</sup>Intern, <sup>3</sup>Associate Professor, <sup>4</sup>Statistician;  
<sup>1,2,3</sup>M. V. P' Samaj College of Physiotherapy, <sup>4</sup> Dr. Vasanttrao Pawar Medical College, Hospital  
and Research Center, Nashik, Maharashtra, India.

Corresponding Author: Dr. Amrit Kaur

DOI: <https://doi.org/10.52403/ijhsr.20240531>

## ABSTRACT

**Background:** Polycystic ovary syndrome (PCOS) stands out as a prevalent endocrine disorder, impacting 8–13% of women in their reproductive years. This condition manifests in multifaceted ways, spanning reproductive, metabolic, and mental health domains. Diagnosis of PCOS relies on the widely accepted Rotterdam criteria, necessitating the observation of two or more indicators such as signs of hyperandrogenism, irregular ovulation, and polycystic ovaries via ultrasound, while ruling out alternative causes.

**Aim:** To evaluate effectiveness of 12 week aerobic and resistance exercise program on cardiometabolic profile and body composition in overweight and obese females with polycystic ovary syndrome.

**Methods:** Purposive sampling for 27 women aged between 18-35 years was done. It was a experimental prepost study. Nulliparous women aged between 18-35 years BMI above 25kg/m<sup>2</sup> and diagnosed with PCOS were included, exclusion was those women who were under medications or taking metformin or OCP or having any medical condition or infection. The exercise protocol was followed in accordance with the international evidence based guideline for the assessment and management of PCOS. Aerobic training (treadmill walking) was given and Resistance training (biceps curl, triceps extension, lunges, squats, plank, crunches) was given for 12 weeks.

**Result:** The results of analysis indicated that 12 week aerobic and resistance exercise have significant effect on cardio metabolic profile and body composition i.e. heart rate (P<0.001), blood pressure(P<0.001), BMI (P <0.001), WHR (P <0.001), FBS (P <0.001), TGL (P <0.001), HDL(P=0.048), LDL (P<0.05).

**Conclusion:** 12 week of aerobic and resistance exercise program shows significant effect on cardio metabolic profile and body composition in overweight and obese females with pcos between the age 18-35 years.

**Keywords:** Fasting blood sugar, low density lipoprotein, high density lipoprotein, triglyceride level, heart rate, body mass index

## **INTRODUCTION**

Polycystic ovary syndrome (PCOS) stands out as a prevalent endocrine disorder, impacting 8–13% of women in their reproductive years. This condition manifests in multifaceted ways, spanning reproductive, metabolic, and mental health domains. The commonly used Rotterdam criteria, which exclude other possible causes and call for the presence of two or more indicators - such as irregular ovulation, symptoms of hyperandrogenism, and ultrasound-detected polycystic ovaries - are what determine if PCOS is diagnosed.<sup>(1)</sup> As such, women diagnosed with PCOS are two to eight times more likely than women without the disorder to experience impaired glucose tolerance and type 2 diabetes mellitus.

However, initial management typically involves lifestyle modifications such as increased physical activity and dietary changes, as these factors can ameliorate insulin resistance and consequently improve both metabolic and reproductive functions. Weight loss is a crucial factor to take into account in the management of reproductive function because numerous studies show that it can help women with PCOS regain their menstrual cycle and ovulation.

<sup>(2)</sup> Lifestyle-related metabolic diseases, like overweight or obesity and insulin resistance. Resistance training, sometimes referred to as weight training or strength training, is a kind of exercise where the muscles in the body are forced to push against an applied force. It consists of workouts using your own body weight, plyometrics, resistance bands, free weights, and machine equipment. <sup>(3)</sup> Some writers suggest doing weight exercise for all main muscle groups two to three non-consecutive days a week at 60% to 70%-85% of one-repetition maximum (1RM), and advancing based on tolerance worsening of PCOS.

Sedentary behavior and excess calorific intake also contribute to it <sup>(4)</sup> A systematic review was conducted to elucidate the impact of exercise as a standalone intervention on clinical outcomes associated

with PCOS. <sup>(5)</sup> Non-obese individuals with PCOS exhibit distinct biochemical and hormonal profiles, yet both lean and obese patients face chronic inflammation, contributing to long-term cardiometabolic complications such as dyslipidemia, metabolic syndrome, type 2 diabetes mellitus, and cardiovascular disease. <sup>(6)</sup>

While exercise is recommended for managing this condition, there's limited understanding of the most effective exercise regimens. Our study evaluated the impacts of high-intensity interval training and strength training on metabolic, cardiovascular, and hormonal parameters in women diagnosed with PCOS.<sup>(7)</sup> This common yet neglected condition urgently requires more extensive research efforts<sup>(8)</sup> Our main objective was to assess the influence of exercise training on reproductive health among women with PCOS. Additionally, we aimed to investigate the impact of exercise training on cardiometabolic indices as a secondary objective.<sup>(9)</sup> Exercise may enhance reproductive and cardiometabolic indices in people with polycystic ovarian syndrome (PCOS), according to preliminary data.<sup>(10)</sup> Their mental health, general well-being, and HRQL seem to be significantly impacted by the wide variety of health issues linked to PCOS.<sup>(11)</sup>

There have been limited published studies focusing on the clinical manifestations and phenotypic presentation of PCOS conducted in Africa, with Sudan being among the countries where such research has been undertaken.

Obesity exacerbates the symptoms of PCOS, and managing weight (through weight loss, maintenance, or prevention of excess weight gain) is suggested as an initial treatment approach. This is ideally accomplished through lifestyle modifications such as dietary adjustments, exercise, and behavioral interventions.<sup>(12)</sup>

The Health-Related Quality of Life (HRQoL) of women with polycystic ovarian syndrome (PCOS) is frequently negatively impacted by a variety of difficulties, such as

psychological problems, emotional anguish, infertility concerns, marital stress, and hirsutism-related disorders.<sup>(13)</sup> While the exact cause of PCOS remains unknown, several primary treatments are available to address its clinical aspects, primarily focusing on ovulation induction agents.<sup>(14)</sup> The utilization of insulin sensitizing agents for prevention and treatment is progressively gaining traction, either independently or in conjunction with other pharmacological approaches.<sup>(15)</sup> Progressive resistance training (PRT) stands out as the most effective exercise method for enhancing both skeletal muscle mass and quality, as evidenced by numerous studies. Particularly noteworthy is its consistent ability to mitigate metabolic disorders such as insulin resistance.<sup>(16)</sup> Owing to diagnostic challenges and the absence of standardized criteria, there's a scarcity of prevalence studies within the community regarding PCOS.<sup>(17)</sup> The majority of studies have focused on adult women aged between 18 and 45 years. This study sought to determine the prevalence of PCOS among Indian adolescents.<sup>(18)</sup> Insulin resistance serves as a cornerstone of PCOS, closely associated with heightened hyperandrogenism, which in turn influences the syndrome's metabolic, reproductive, and psychological characteristics. Management of insulin resistance in women with PCOS typically involves weight loss, lifestyle adjustments (such as exercise and diet), and the use of insulin-sensitizing medications.<sup>(19)</sup> Sudan is one of the African nations where study has been conducted on the clinical signs and phenotypic presentation of PCOS, but there aren't many published papers on this topic.<sup>(20)</sup>

## **MATERIALS & METHODS**

**Study Design:** Experimental pre post study.

**Sampling Method:** Purposive Sampling

**Study Population:** 18–35-year-old women with PCOS.

**Study Duration:** 20 weeks

**Intervention Period:** 6 weeks.

**Place of study:** Nashik

**Sample Size:** 27

**Inclusion criteria:** <sup>(16,19,20)</sup> and **Exclusion criteria:** <sup>(3,6,9)</sup>

Nulliparous women aged between 18-25 years BMI above 25kg/m<sup>2</sup> and diagnosed with pcos were included, exclusion was those women who were under medications or taking metformin or ocp or having any medical condition or infection.

## **OUTCOME MEASURES:**

**Body composition-** Height, Weight, BMI, Waist-Hip Measurement and ratio.

**Blood Glucose -** HBA1C, FBS

**Lipid Profile -** TOTAL CHOLESTEROL, LDL, HDL, TGL

**Blood pressure and HR**

## **PROCEDURE**

The details of the study and objectives of the protocol were explained to the participants and informed consent was obtained. The participants were allowed to leave the study whenever they were reluctant to continue. Using the ACSM guidelines as a guide, the waist circumference (WC) and hip circumference (HC) were measured. The BMI (kg/m<sup>2</sup>) was calculated by dividing body weight by the square of the height, and by dividing the waist circumference (WC) in centimeters by the hip circumference (HC) in centimeters, one can calculate the waist-to-hip ratio (WHR). Blood samples: At baseline and after 12 weeks of training, peripheral blood was drawn in the morning following an overnight fast. Baseline HR and blood pressure were also measured at baseline and after 12 weeks of intervention. A mercury sphygmomanometer was used to monitor blood pressure three times after five minutes of rest, with the final two readings being averaged. Heart rate was evaluated by palpating the radial pulse. The exercise protocol was followed in accordance with the international evidence-based guidelines). Evidence-based recommendations for the diagnosis and treatment of polycystic ovarian syndrome (2018) Three times a week, for 45 minutes on the last week,

participants increased the duration of their aerobic training from 30 minutes on the first week. Additionally, resistance training was conducted twice weekly, with durations also

increasing progressively from 20 minutes in the first week to 30 minutes by the last week. To determine training intensity, the HRmax formula (220 - age) was utilized.

**Table no. 1 Duration and intensity per 3 weeks**

WEEKS	DURATION AERBOIC (Minutes)
1-3	30
4-6	35
7-9	40
10-12	45

DURATION RESISTANCE (Minutes)	INTENSITY
20	50-55%
25	55-60%
30	60-65%
30	65-70%

### STATISTICAL ANALYSIS

Wilcoxon signed rank test is applied for non-normal data by after checking normality assumptions by Shapiro wilk test (as sample size is small <30) Instead of

Mean and SDs, Medians are compared before intervention and after intervention for heart rate, systolic blood pressure, BMI, WHR, FBS, TGL and HDL.

	post Heart Rate - pre-Heart Rate	post BMI - pre-BMI	post WHR - pre WHR	post FBS - pre FBS	post TGL - pre TGL	post HDL - pre-HDL
Z	-4.545 <sup>a</sup>	-4.545 <sup>a</sup>	-4.573 <sup>a</sup>	-4.251 <sup>a</sup>	-3.365 <sup>a</sup>	-1.979 <sup>a</sup>
Asymp. Sig. (2-tailed)	P <0.001	P <0.001	P <0.001	P <0.001	P <0.001	0.048
a. Based on positive ranks.						
b. Wilcoxon Signed Ranks Test						

Paired t test was applied for diastolic BP and LDL variables as they are having normality assumptions.

Heart rate (P <0.001), blood pressure (P <0.001), BMI (P <0.001),WHR(P <0.001), FBS(P <0.001), TGL(P <0.001), HDL(P=0.048).

	Pre systolic blood pressure	Post systolic blood pressure
Mean	120.19	116.33
Z	11.27	10.10

### DISCUSSION

In this study, we looked at how a 12-week aerobic and resistance training program affected the body composition and cardio metabolic profile of overweight and obese women with PCOS who were between the ages of 18 and 35. Total 27 participants were taken based on the inclusion and exclusion criteria and were given aerobic exercise 3 times a week and resistance exercises 2 times a week. This signifies that when we perform aerobic exercises the biochemical adaptations trigger a series of physiological stimuli that increase the oxygen uptake and oxidation of free fatty acids and circulate glucose as an energy source. As a result, there was an increase in aerobic metabolism to provide the energy needed for muscular contractions, which also decreased body fat accumulation, decreased the rate of obesity,

### RESULT

The study was conducted on 27 subjects. The results in the study shows that aerobic and resistance exercises show significant effect on cardio metabolic profile and body composition in overweight and obese females with polycystic ovary syndrome. On comparing the pre and post values of the outcome measures after the intervention like aerobic and resistance exercise, significant difference was found.

Paired Samples Statistics				
		Mean	N	Std. Deviation
Pair 1	Pre-Diastolic BP	79.04	27	12.19
	post Diastolic BP	75.93	27	8.44
Pair 2	pre-LDL	111.44	27	25.28
	post LDL	101.52	27	14.28

and enhanced cardiorespiratory fitness.<sup>(2)</sup> When we perform resistance exercises it signifies the reduction of androgen cell receptor in certain muscle groups. So which eventually decreases the androgen level. Resistance training is the type of exercise that body to push against force that is practices against it. So as a result it benefits your musculoskeletal system, it improves insulin resistance, glucose metabolism and resting metabolic rate, and lowers body fat.<sup>(4)</sup> Hence, when we combine both aerobic and resistance exercise both shows its significant effect on cardiometabolic profile and body composition in overweight and obese women aged between 18-35 years. Hypothesis has been supported as the scores of the cardiometabolic profile and body composition after 12 week of aerobic and resistance exercises were statistically and significantly higher than before receiving it. There was significant improvement seen in the cardiometabolic profile and body composition. Despite our expectations, not all studies have provided comprehensive descriptions of their interventions. For instance, they define 'lifestyle intervention' as a calorie-controlled diet consisting of healthy food options and at least 150 minutes of exercise per week, with 90 minutes of aerobic activity. Two trained coaches, a nutritionist, and an exercise physiologist introduced both diet and exercise components, including aerobic and progressive resistance training. However, crucial details regarding participants' training and diet are absent, making it difficult to draw any conclusions. Additional studies employed three distinct groups: one receiving diet and aerobic exercise (DA), another receiving diet and aerobic resistance exercise (DC), and a third receiving diet only (DO). The exercise sessions were supervised, and participants maintained a weekly exercise diary along with a daily food quantity checklist. The aerobic exercise regimen involved walking or jogging five times a week, starting at 25–30 minutes at 60%–65% maximum heart rate in the first week and progressing to 45

minutes at 75%–80% maximum heart rate by the study's conclusion. The five activities in resistance training were bench press, lat pulldown, leg press, knee extension, and sit-ups. These exercises were performed twice a week on non-consecutive days. Initially, the training load was set at 50%–60% of one-repetition maximum (1RM), which was increased to 65%–75% of 1RM in subsequent weeks. Load adjustments were made if participants could complete 3 sets of 12 repetitions with the current load. We also have concerns regarding the prioritization of aerobic exercise over resistance training, with only two sessions of resistance training per week likely insufficient. This imbalance may explain the lack of differences between the two exercise groups, with only one exception noted. Regarding the inclusion of sit-ups in the regimen, while they are valuable for strength training, we advocate for more compound exercises such as squats, particularly in this type of study. It's possible that factors such as participants' weight or their status as beginners might hinder the execution of squats, but supervision could mitigate potential risks. Similarly, jogging might not be suitable for participants due to their weight, emphasizing the importance of supervised exercise. Furthermore, we note the absence of sample size determination and power calculation, likely attributable to these studies being among the first on this topic. The studies revealed significant bodyweight reduction across all three groups. Furthermore, participants showed improvements in ovulation and/or menstrual cycle patterns across all groups.

## **CONCLUSION**

12 week of aerobic and resistance exercise program shows significant effect on cardio metabolic profile and body composition in overweight and obese females with PCOS between the age 18-35 years.

### ***Declaration by Authors***

**Ethical Approval:** Approved

**Acknowledgement:** Thank you MUHS for the grant.

**Source of Funding:** MUHS

**Conflict of Interest:** The authors declare no conflict of interest.

## REFERENCES

1. Patten RK, Boyle RA, Moholdt T et al. Exercise Interventions in Polycystic Ovary Syndrome: A Systematic Review and Meta-Analysis. *Front Physiol.* 2020 Jul 7;11:606.
2. Dos Santos IK, 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 Apr;99(16):e19644.
3. Chinmayee Shah, Sanskruti Tahakik. Effect of customized resistance training on body mass index and quality of life in individuals with polycystic ovarian syndrome - a randomized clinical trial. *Int J Health Sci Res.* 2022; 12(9):134-143. DOI: <https://doi.org/10.52403/ijhsr.20220918>
4. Pericleous P, Stephanides S. Can resistance training improve the symptoms of polycystic ovary syndrome? *BMJ Open Sport Exerc Med.* 2018 Aug 21;4(1):e000372.
5. Harrison CL, Lombard CB, Moran LJ et al. Exercise therapy in polycystic ovary syndrome: a systematic review. *Hum Reprod Update.* 2011 Mar-Apr;17(2):171-83.
6. Rojas J, Chávez M, Olivar L, Rojas M, Morillo J, Mejías J, Calvo M, Bermúdez V. Polycystic ovary syndrome, insulin resistance, and obesity: navigating the pathophysiologic labyrinth. *Int J Reprod Med.* 2014;2014:719050.
7. Almenning I, Rieber-Mohn A, Lundgren KM et al. Effects of High Intensity Interval Training and Strength Training on Metabolic, Cardiovascular and Hormonal Outcomes in Women with Polycystic Ovary Syndrome: A Pilot Study. *PLoS One.* 2015 Sep 25;10(9):e0138793.
8. Teede HJ, Misso ML, Costello MF et al; International PCOS Network. Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. *Fertil Steril.* 2018 Aug;110(3):364-379.
9. Behboodi Moghadam Z, Fereidooni B, Saffari M et al. Measures of health-related quality of life in PCOS women: a systematic review. *Int J Womens Health.* 2018 Aug 1;10:397-408.
10. Benham JL, Yamamoto JM, Friedenreich CM et al. Role of exercise training in polycystic ovary syndrome: a systematic review and meta-analysis. *Clin Obes.* 2018 Aug;8(4):275-284.
11. Costa EC, DE Sá JCF, Stepto NK et al. Aerobic Training Improves Quality of Life in Women with Polycystic Ovary Syndrome. *Med Sci Sports Exerc.* 2018 Jul;50(7):1357-1366.
12. Lim SS, Hutchison SK, Van Ryswyk E et al. Lifestyle changes in women with polycystic ovary syndrome. *Cochrane Database Syst Rev.* 2019 Mar 28;3(3):CD007506.
13. Jones GL, Benes K, Clark TL et al. The Polycystic Ovary Syndrome Health-Related Quality of Life Questionnaire (PCOSQ): a validation. *Hum Reprod.* 2004 Feb;19(2):371-7.
14. Teede HJ, Misso ML, Deeks AA et al. Guideline Development Groups. Assessment and management of polycystic ovary syndrome: summary of an evidence-based guideline. *Med J Aust.* 2011 Sep 19;195(6):S65-112.
15. Santos IKD, Nunes FASS, Queiros VS et al. Effect of high-intensity interval training on metabolic parameters in women with polycystic ovary syndrome: A systematic review and meta-analysis of randomized controlled trials. *PLoS One.* 2021 Jan 19;16(1):e0245023.
16. Vizza L, Smith CA, Swaraj S et al. The feasibility of progressive resistance training in women with polycystic ovary syndrome: a pilot randomized controlled trial. *BMC Sports Sci Med Rehabil.* 2016 May 11;8:14.
17. Gill H, Tiwari P, Dabadghao P. Prevalence of polycystic ovary syndrome in young women from North India: A Community-based study. *Indian J Endocrinol Metab.* 2012 Dec;16(Suppl 2):S389-92.
18. Nidhi R, Padmalatha V, Nagarathna R, Amritanshu R. Prevalence of polycystic ovarian syndrome in Indian adolescents. *J Pediatr Adolesc Gynecol.* 2011 Aug;24(4):223-7.

19. Hiam D, Patten R, Gibson-Helm M, Moreno-Asso A et al. The effectiveness of high intensity intermittent training on metabolic, reproductive and mental health in women with polycystic ovary syndrome: study protocol for the iHIT- randomised controlled trial. *Trials*. 2019 Apr 16;20(1):221.
20. Bozdag G, Mumusoglu S, Zengin D et al. The prevalence and phenotypic features of polycystic ovary syndrome: a systematic review and meta-analysis. *Hum Reprod*. 2016 Dec;31(12):2841-2855.
- How to cite this article: Amrit Kaur, Mahima Dadhich, Deepti Wadhwa, Sunil Patil. Effect of 12 week aerobic and resistance exercise program on cardiometabolic profile and body composition in overweight and obese females with polycystic ovary syndrome between the age 18-35 years. *Int J Health Sci Res*. 2024; 14(5):242-248. DOI: [10.52403/ijhsr.20240531](https://doi.org/10.52403/ijhsr.20240531)

\*\*\*\*\*