

Effect of Home Based High Intensity Interval Training on Abdominal Obesity Cardiopulmonary Fitness and Quality of Life in a 39 Year Old Woman with Polycystic Ovarian Syndrome

Ishita Namdev

Paramedical Department, People's University, Bhopal, M.P., India

DOI: <https://doi.org/10.51584/IJRIAS.2026.11070204>

Received: 10 August 2026; Accepted: 16 August 2026; Published: 22 August 2026

ABSTRACT

Background - Polycystic ovarian syndrome (PCOS), a common endocrine disorder affecting women of reproductive age, is associated with insulin resistance, hormonal imbalance, reduced cardiorespiratory fitness, and a lower quality of life. It is believed that exercise-based therapies, especially High-Intensity Interval Training (HIIT), are effective non-pharmacological ways to improve metabolic and functional outcomes in PCOS.

Case presentation - A 39-year-old woman with PCOS complained of irregular menstrual cycles, exhaustion, and decreased physical endurance. Clinical results showed a decline in quality of life and functional fitness.

Interventions - high-intensity aerobic exercise with low-intensity recovery periods in a structured home-based HIIT program. Over a predetermined intervention period, the program was conducted on a regular basis under supervision.

Result - Following the intervention, the patient showed improvements in their overall quality of life, decreased levels of fatigue, and improved cardiorespiratory endurance. Better adherence to physical activity and increased exercise tolerance were also noted.

Conclusion - For women with PCOS, home-based HIIT is a practical, efficient, and successful intervention for enhancing cardiorespiratory fitness and quality of life. For long-term lifestyle management, it might be a useful rehabilitation strategy.

Keywords:- Cardiorespiratory Fitness, Exercise Therapy, High-Intensity Interval Training (HIIT), PCOS, and Quality of Life

BACKGROUND

PCOS is a complex endocrine and metabolic disorder that frequently manifests as anovulation, infertility, obesity, insulin resistance, and polycystic ovaries. Among the risk factors for PCOS in women are obesity, gut dysbiosis, neuroendocrine changes, genetics, lifestyle or diet, and environmental pollutants. These factors may increase metabolic syndrome by causing hyperinsulinemia, oxidative stress, hyperandrogenism, impaired folliculogenesis, and irregular menstrual cycles. Dysbiosis of the gut microbiota may lead to PCOS. Using probiotics, prebiotics, or a fecal microbiota transplant (FMT) to restore gut microbiota may be a new, efficient, and noninvasive way to treat and prevent PCOS. The eubiosis of gut microbiota and miRNA therapy are two potential therapeutic interventions that may help treat and manage PCOS. This review also covers the variety of risk factors that may be involved in the etiology, prevalence, and modulation of PCOS

Definition - Polycystic ovary syndrome (PCOS) is a common hormonal disorder that affects women during their reproductive years and into later stages of life. It causes irregular menstrual cycles, abnormal ovulation, infertility, excessive facial or body hair, and/or acne. Stein-Leventhal syndrome or hyperandrogenic anovulation (HA) are other names for polycystic ovarian syndrome (PCOS). Polycystic ovary syndrome is one

of the most common endocrine system disorders affecting women who are fertile. Menstrual dysfunction, infertility, hirsutism, acne, and obesity are some of the symptoms of this chronic and diverse disorder. It characterizes a condition in which at least one ovary has an ovarian volume larger than 10 mL and at least one ovary has ten small cysts that range in diameter from 2 to 9 mm. Compared to women without PCOS, women with PCOS are more likely to experience a number of long-term health issues that impact their physical and mental well-being, such as obesity, insulin resistance, and type 2 diabetes. Anovulation, hyperandrogenism, and polycystic ovaries are the three main characteristics of PCOS.

Etiology This multifactorial condition's intricately linked pathophysiology makes it challenging to pinpoint its underlying causes. Environmental contaminants, dietary and lifestyle choices, genetic factors, obesity, and gut dysbiosis can all influence the genesis, prevalence, and modulation of the PCOS phenotype.

Excessive androgen secretion from the ovaries may be caused by a number of factors, such as resistance to insulin. Your body may react poorly to insulin if you have PCOS. The pancreas produces the hormone insulin. It permits your body's primary energy source, sugar, to be used by cells. Blood sugar levels rise when cells don't react to insulin as they normally would. In an effort to lower blood sugar, your body then produces more insulin. Your body produces more insulin when you are overweight or obese gene.

Certain genes may be connected to PCOS, according to some research. You may be more likely to have PCOS if there is a family history of the condition.

Environmental Pollutants' Etiological Role. - Numerous studies have demonstrated that environmental contaminants, including pesticides, heavy metals, and endocrine-disrupting chemicals (EDCs), have a major impact on human health and reproduction. In fact, there is growing evidence that environmental contaminants play a role in the onset of PCOS.

Epidemiology - 4–10% of women of reproductive age are expected to have PCOS globally, according to a systematic screening of women using the National Institutes of Health (NIH) diagnostic standards [1]. PCOS affects 1.55 million women of reproductive age worldwide, resulting in 0.43 million disability-adjusted life years (DALYs). According to estimates from the World Health Organization (WHO), PCOS affected 116 million women (3.4%) in 2012. there were 82.44 cases of PCOS per 100,000 women of reproductive age, which is 1.45% more than in 2007.

Prevalence - According to reports, the prevalence of PCOS in India ranges from 3.7% to 22.5%. Urban populations have higher rates because of sedentary lifestyles, obesity, poor eating habits, and rising stress levels. According to recent research, PCOS is emerging as a major public health issue among young Indian women.

Relevant Anatomy - The ovaries are two female reproductive organs situated in the pelvic cavity on either side of the uterus. Ova (eggs) and female sex hormones, such as progesterone and estrogen, are produced by each ovary, which is about 3 to 5 cm long. One dominant follicle matures and releases an ovum through ovulation during a typical menstrual cycle.

Physiology - The hypothalamic-pituitary-ovarian (HPO) axis controls normal ovarian function. Gonadotropin-Releasing Hormone (GnRH), which is secreted by the hypothalamus, causes the anterior pituitary gland to release luteinizing hormone (LH) and follicle-stimulating hormone (FSH). While LH causes ovulation and the formation of the corpus luteum, FSH encourages follicular growth. Through feedback mechanisms, the ovaries produce progesterone and estrogen, which control the menstrual cycle and reproductive function.

Biomechanics - Gait mechanics are impacted by abdominal obesity in PCOS because it increases walking energy costs and decreases movement efficiency. Visceral fat buildup can change lower limb biomechanics and restrict trunk mobility, which can lead to shorter strides, slower walking speeds, and more strain on weight-bearing joints. These biomechanical alterations may worsen physical fitness and further decrease engagement in physical activity.

Sign and symptoms - Period irregularities: Missed or nonexistent periods are indicative of abnormal menstruation. Heavy bleeding during periods may also be a part of it. Unusual hair growth: You may develop a lot of facial hair or hirsutism, or heavy hair growth on your arms, chest, and abdomen. Up to 70% of PCOS sufferers are impacted by this. Acne: PCOS can lead to acne, particularly on the face, back, and chest. Treatment for this acne may be challenging and may persist past adolescence. Obesity: Between 40% and 80% of individuals with PCOS struggle to maintain a healthy weight and are obese. Skin darkening: You may develop patches of dark skin, particularly under your breasts, in the groin (between your legs), under your armpits, and in the folds of your neck. We call this acanthosis nigricans. Cysts: On ultrasound, many PCOS patients have ovaries that look bigger or have a lot of follicles (egg sac cysts) Skin tags are small flaps of extra skin. They frequently appear on your neck or in your armpits. Hair thinning: People with PCOS may begin to go bald or lose patches of hair on their heads. Infertility: The most frequent cause of infertility in women is PCOS. Inability to conceive may arise from irregular or infrequent ovulation.

Investigation- Discuss your medical history and symptoms with you. Find out about the medical history of your biological family. Check your blood pressure and weight. Do a physical examination, paying particular attention to skin tags, acne, discolored skin, excess facial hair, and hair loss. Examine the pelvis for additional reasons why the bleeding is abnormal. To measure glucose and hormone levels, order blood tests. To examine your ovaries, measure the thickness of your uterine lining, and search for additional reasons for irregular bleeding, do a pelvic ultrasound.

Treatment - Based on your symptoms, medical history, and other health issues, as well as whether you wish to become pregnant, your healthcare provider will decide how best to treat you. Medication, lifestyle modifications, or a mix of the two can be used as treatments. Lifestyle modifications: Maintaining a healthy body weight and eating a balanced diet can improve insulin levels.

Aim

To evaluate the effect of Home-Based High-Intensity Interval Training (HIIT) on abdominal obesity, cardiorespiratory fitness, and quality of life in a 39-year-old woman with Polycystic Ovary Syndrome (PCOS).

Objective

To measure waist circumference and body mass index (BMI) in order to evaluate the impact of home-based HIIT on abdominal obesity. To use the Six-Minute Walk Test to assess how home-based HIIT affects cardiorespiratory fitness. To use the PCOS Health-Related Quality of Life Questionnaire (PCOSQ) to assess the impact of home-based HIIT on quality of life.

Case description

A 39-year-old woman complained of irregular menstruation and lack of periods for several months. The patient complained of increasing abdominal circumference, decreased tolerance to physical activity, progressive weight gain, and trouble carrying out extended daily tasks. Her general quality of life and level of physical fitness had suffered as a result of these symptoms. Based on the results of a pelvic ultrasound, the patient was diagnosed with Polycystic Ovary Syndrome (PCOS). A 3.0×2.2 mm. cyst in the right ovary was discovered by ultrasound, which is consistent with polycystic ovarian morphology.

Clinical assessment –

Age – 39 year old

Gender - female

Medical Diagnosis : Polycystic Ovary Syndrome (PCOS)

Chief Complaint: Absence of menstrual periods weight gain, abdominal obesity

Duration of symptoms – 3 month

Weight – 70 kg Height – 5'1 (155cm) BMI - 29.1 kg/m² Waist Circumference- 42 inches

Menstrual History - Irregular menstrual cycle / Amenorrhea Ultrasound Findings – 3.0×2.2 mm

Physical Activity Level – Sedentary

Blood pressure – 130/85 mmHg

Heart rate- 82 bpm

Respiratory rate - 18 breaths/min

Six-Minute Walk Test (6MWT)- 420 meters

Rating of Perceived Exertion (RPE) -moderate PCOSQ Score- 110/182 Quality of Life- sedantry.

Intervention

High-Intensity Interval Training (HIIT) at Home

Time frame: 8 weeks

Regularity: Four sessions every week

Duration of the session: 25–30 minute

Marching in Place

To increase body temperature, prepare cardiovascular system and initiate warm-up

Patient position: Standing erect, feet hip-width apart, arms relaxed by the side.

Therapist position: Standing in front/side of patient.

Patient alternately lifts one foot and then the other while moving the arms naturally. Maintain upright posture and controlled breathing. Gradually increase pace according to tolerance.

Arm Circles

Goal :To improve upper-limb mobility and prepare shoulder muscles for exercise

Patient position: Standing, feet shoulder-width apart, arms at shoulder level

Therapist position: Standing in front of patient

Procedure: Make controlled circular movements with both arms, first forward and then backward.

Dynamic Stretching

Goals: To improve flexibility and prepare major muscle groups for exercise

Patient position: Standing with adequate space

Therapist position: Standing beside patient

Procedure: Perform controlled leg swings, knee lifts and arm swings without bouncing or holding the position.

Duration:2.5 min

High Knees

Goal: To improve cardiorespiratory fitness and lower-limb endurance

Patient position: Standing upright, arms bent

Therapist position: Standing in front/side

Procedure: Alternately raise knees toward waist level while coordinating opposite arm movement. Increase speed according to tolerance.

Duration: 30 second

Jumping Jacks

Goal: To improve cardiovascular endurance and whole-body coordination

Patient position: Standing, feet together, arms by sides

Therapist position: Standing in front/side

Procedure: Move feet outward while raising arms overhead, then return to starting position. Step-out version can be used if required.

Duration: 30 sec

Slow Walking – Recovery

Goals: To promote active recovery between intervals

Patient do Walking

Walk slowly with relaxed breathing.

60 sec

Body-Weight Squats

Goal: To improve lower-limb muscular endurance and increase energy expenditure

Patient position: Standing, feet shoulder-width apart

Therapist position: Standing slightly behind and to the side

Procedure: Push hips backward and bend knees as if sitting on a chair. Keep chest upright and knees aligned with toes. Return to standing.

Duration: 30 sec

Slow Walking – Recovery

Goal: To reduce fatigue and allow cardiovascular recovery

Patient position: Walking

Duration: 60 sec

Modified Burpees

Goal: To improve whole-body strength, cardiovascular fitness and functional endurance

Patient position: Standing, feet shoulder-width apart

Therapist position: Standing beside patient

Procedure: Bend down, place hands on a stable surface/floor, step feet backward one at a time into a plank position, step them forward and return to standing.

Duration: 30 sec

Slow Walking – Recovery

Goal: To restore breathing and prepare for cool-down

Patient do Walking

Walk slowly until breathing becomes comfortable.

Duration: 60 sec

Cool- down + breathing exercises

Goal To gradually reduce heart rate and prevent sudden cessation of exercise

Patient do Standing/walking

Walk slowly followed by deep, controlled breathing.

Duration 2–3 min

Hamstring, quadriceps and calf stretches

Goal: To reduce muscle tightness and improve flexibility

Patient position: Standing

Procedure Perform gentle static stretches without bouncing or pain.

Summary of 2–3 min HIIT Protocol

Phase	Activity	Duration
Warm-Up	Marching in place, arm circles, spot walking, dynamic stretching.	5 Minutes
Interval 1	High Knees.	30 Seconds
	Recovery Slow Walking.	60 Seconds
Interval 2	Jumping Jacks.	30 Seconds
	Recovery Slow Walking.	60 Seconds
Interval 3	Body Weight Squats	30 Seconds
	Recovery Slow Walking.	60 Seconds
Interval 4	Spot Jogging.	30 seconds
	Recovery Slow Walking.	60 Seconds
Interval 5	Modified Burpees.	30 Seconds
	Recovery Slow Walking.	60 Seconds
Repeat	Complete 2 Rounds of the above Circuit	10 cycles
		total

..Cool Down-----

(Deep breathing exercises, hamstring stretch, calf stretch, quadriceps stretch)-----for 5 Minutes

Progression of Exercise Program

Week 1–2

HIIT exercises and proper technique

Week 3–4

Increased movement speed and exercise tolerance

Week 5–6

Moderate to vigorous intensity maintained

Week 7–8

Maximum tolerated intensity with proper form

UNIQUENESS OF THE STUDY

A lack of access to rehabilitation facilities, work obligations, household responsibilities, and financial constraints prevent many women from attending regular supervised sessions. The High-Intensity Interval Training (HIIT) program that can be done at home without the need for specialized equipment is the subject of this case study. This study is unique in that it assesses the combined impact of a straightforward at-home HIIT regimen on three significant aspects of PCOS at the same time: quality of life, cardiorespiratory fitness, and abdominal obesity.

RESULT

The patient showed improvement in abdominal obesity after completing the 8-week Home-Based HIIT program, as evidenced by a decrease in body weight, BMI, and waist circumference. The Six-Minute Walk Test distance increased from 420 to 504 meters, and the resting heart rate decreased, indicating an improvement in cardiorespiratory fitness. Improved exercise tolerance was indicated by the Borg Rating of Perceived Exertion, which dropped from 6/10 to 4/10. Additionally, the patient's quality of life significantly improved, as evidenced by the PCOSQ score rising from 110/182 to 145/182.

Outcome Measure	Pre-treatment	Post-treatment
Weight	70 kg	67 kg
BMI	29.1	27.9
Waist Circumference	42 inches	39.3 inches
Heart Rate	82 bpm	78 bpm
6-Minute Walk Test (6MWT)	420 m	504 m
PCOSQ Scale	110	145

DISCUSSION

This case study assessed how an 8-week home-based high-intensity interval training (HIIT) program affected the quality of life, cardiorespiratory fitness, and abdominal obesity of a 39-year-old woman with polycystic ovary syndrome (PCOS). Body weight, BMI, waist circumference, exercise tolerance, cardiorespiratory fitness, and quality of life all showed improvements after the intervention. According to these results, home-based HIIT was successful in lowering abdominal obesity. Almenning et al. reported similar results, showing that HIIT training significantly reduced body fat and improved metabolic health in PCOS-affected women.

Through repeated exposure to brief bursts of intense exercise, HIIT is known to enhance aerobic capacity, oxygen utilization, and cardiovascular efficiency. Following the intervention, the Borg Rating of Perceived Exertion (RPE) dropped from 6/10 to 4/10, suggesting increased exercise tolerance and decreased physical activity fatigue. The PCOSQ score increased from 110/182 to 145/182, indicating a significant improvement in quality of life. Psychological distress, low self-esteem, and issues with body image are common among women with PCOS. The use of a home-based exercise program, which was practical, affordable, and simple to integrate into the patient's daily routine, is one of the case study's main advantages. Home-based HIIT requires less equipment than supervised gym-based programs and may increase exercise adherence in women with limited access to fitness centers.

CONCLUSION

After eight weeks of high-intensity interval training, women with polycystic ovary syndrome and their quality of life. Following high-intensity interval training, body composition considerably improved. According to this pilot study, exercise training can help people with polycystic ovarian syndrome improve their cardiorespiratory profile. The results indicate that for women with PCOS, home-based HIIT is a useful, secure, affordable, and readily available physiotherapy intervention. It might aid in controlling the symptoms of obesity and enhancing general physical and mental health. As a result, home-based HIIT can be regarded as an important part of conservative PCOS management.

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