



IMPACT OF LIFESTYLE MODIFICATIONS IN THE MANAGEMENT OF POLYCYSTIC OVARY SYNDROME (PCOS)

Article History:

Name of Author:

Uzma Amin ¹, khursheeda ², Hajra Huma ³, Huma Akbar ⁴

Affiliation: ¹District specialist OBS and gynae Dogra hospital Bara district Khyber .

Chairperson of BOD at HEADS NGO
dr.uzmaamin21@gmail.com

²SR PIMS hospital Peshawar
dr.Khushiahmad@gmail.com

³Women Medical Officer Gynea and Obs Moulvi Ameer Shah Memorial Hospital Peshawar.
drhajrahuma@gmail.com

⁴WMO working as incharge in DHQ Hospital Bajawarh
drhumaakbar@gmail.com

Corresponding Author:

Hamid Ullah

Assistant Professor, Department of Gastroenterology, Qazi Hussain Ahmed Medical complex, Nowshera

Email: Drhamidullah222@gmail.com

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Abstract: Background :Polycystic ovary syndrome (PCOS) is a prevalent and complex endocrine disorder affecting women of reproductive age, with an estimated global prevalence of 6–20% depending on diagnostic criteria. It is characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology, as defined by the Rotterdam criteria. Insulin resistance plays a pivotal role in its pathophysiology, contributing to metabolic disturbances and exacerbating hyperandrogenism. Consequently, women with PCOS are at increased risk of infertility, metabolic syndrome, and psychological morbidity. Given its multifactorial nature, lifestyle modification is widely recommended as the first-line management strategy. **Objective:** To evaluate the impact of a structured lifestyle modification program on metabolic, hormonal, and reproductive outcomes in women diagnosed with PCOS. **Methods:** This prospective interventional study included 100 women diagnosed with PCOS according to the Rotterdam criteria. Participants underwent a six-month structured lifestyle intervention comprising individualized dietary modification, a supervised exercise regimen (≥ 150 minutes/week), and regular behavioral counseling. Baseline and post-intervention assessments included anthropometric measurements, blood pressure, fasting blood glucose, insulin levels, lipid profile, serum testosterone, luteinizing hormone (LH), follicle-stimulating hormone (FSH), sex hormone-binding globulin (SHBG), and calculation of HOMA-IR. Pelvic ultrasound was performed to assess ovarian morphology. Data were analyzed to determine changes in metabolic, hormonal, and reproductive parameters. **Results:** Following six months of intervention, statistically significant improvements were observed in body mass index (BMI), fasting insulin levels, HOMA-IR, and serum testosterone levels ($p < 0.05$). Favorable changes in lipid profile, including reductions in total cholesterol, LDL, and triglycerides, along with increased HDL levels, were also noted. Waist circumference decreased significantly, reflecting reduced central obesity. Reproductive outcomes improved markedly, with restoration of menstrual regularity and enhanced ovulatory function in a substantial proportion of participants. Clinical manifestations of hyperandrogenism, such as hirsutism and acne, demonstrated mild to moderate improvement. **Conclusion:** Structured lifestyle modification yields significant improvements in metabolic, hormonal, and reproductive outcomes in women with PCOS. These findings reinforce the role of lifestyle intervention as a cornerstone, non-pharmacological strategy in the management of PCOS, with potential to reduce long-term health risks and improve quality of life.

Keywords: PCOS, Lifestyle modification, Insulin resistance, Weight loss, Ovulation, Diet therapy

INTRODUCTION

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age, with an estimated global prevalence ranging from 6% to 15%, depending on the population studied and the diagnostic criteria applied. It is a complex and heterogeneous condition characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology. Beyond its reproductive manifestations, PCOS is increasingly recognized as a metabolic disorder with significant long-term health implications. The condition commonly presents during adolescence or early adulthood and often persists throughout the reproductive years, significantly impacting fertility, metabolic health, and psychological well-being.

The pathophysiology of PCOS is multifactorial and involves a complex interaction between genetic predisposition, environmental influences, and hormonal dysregulation. Insulin resistance plays a central role in the development and progression of the syndrome. A substantial proportion of women with PCOS exhibit peripheral insulin resistance independent of obesity, although the presence of excess adiposity further exacerbates the condition. Compensatory hyperinsulinemia stimulates ovarian theca cells to produce excess androgens and suppresses hepatic production of sex hormone-binding globulin (SHBG), thereby increasing circulating free testosterone levels. This hormonal imbalance contributes to clinical manifestations such as hirsutism, acne, irregular menstrual cycles, and anovulatory infertility.

Obesity, particularly central or abdominal obesity, is highly prevalent among women with PCOS and significantly worsens both metabolic and reproductive abnormalities. Adipose tissue dysfunction contributes to chronic low-grade inflammation, altered adipokine secretion, and further impairment of insulin signaling. As a result, women with PCOS are at increased risk for impaired glucose tolerance, type 2 diabetes mellitus, dyslipidemia, hypertension, and metabolic syndrome. Long-term cardiovascular risk is therefore elevated, making early identification and management crucial.

Weight reduction has been consistently shown to improve both metabolic and reproductive outcomes in women with PCOS. Even a modest weight loss of 5–10% of initial body weight can restore ovulatory cycles, improve menstrual regularity, reduce serum androgen levels, and enhance insulin sensitivity. Additionally, weight loss contributes to improved lipid profiles and decreased cardiovascular risk factors. Lifestyle modification, including dietary

changes, regular physical activity, and behavioral interventions, is therefore recommended as the first-line management strategy, particularly for overweight and obese women. Early intervention not only alleviates symptoms but also reduces the long-term burden of metabolic and cardiovascular complications associated with PCOS.

In addition to its metabolic and reproductive consequences, PCOS has significant psychological and social implications. Women with PCOS frequently report higher rates of anxiety, depression, body image dissatisfaction, and reduced quality of life compared to women without the condition. Symptoms such as hirsutism, acne, obesity, and infertility can negatively affect self-esteem and interpersonal relationships. The chronic nature of the disorder, along with concerns about future fertility and long-term health risks, further contributes to emotional distress. Therefore, comprehensive management of PCOS should address not only physical symptoms but also psychological well-being. Given the multifaceted nature of PCOS, early diagnosis and individualized treatment are essential. While pharmacological therapies such as insulin sensitizers, oral contraceptive pills, and ovulation induction agents are commonly used, lifestyle modification remains the cornerstone of management. Sustainable dietary practices, consistent physical activity, and behavioral support strategies are critical in achieving long-term success. A multidisciplinary approach involving gynecologists, endocrinologists, dietitians, and mental health professionals may optimize outcomes. Understanding the central role of insulin resistance and obesity in PCOS underscores the importance of preventive strategies aimed at reducing metabolic risk and improving overall reproductive health.

Methodology:

Study Design:

This was a prospective interventional study conducted to evaluate the impact of structured lifestyle modification on metabolic, hormonal, and reproductive outcomes in women with polycystic ovary syndrome (PCOS). The study design allowed for direct observation of changes within the same participants over the study period, providing a clear assessment of the effects of the intervention.

Study Population and Sample Size:

A total of 100 women aged 18–35 years, diagnosed with PCOS according to the Rotterdam criteria, were enrolled in the study. Inclusion criteria included women with clinical or biochemical

hyperandrogenism, ovulatory dysfunction (oligomenorrhea or amenorrhea), and/or polycystic ovarian morphology on ultrasound, after exclusion of other endocrine disorders such as thyroid dysfunction, hyperprolactinemia, or congenital adrenal hyperplasia. Participants with severe comorbidities, pregnancy, or those already on hormonal or insulin-sensitizing medications were excluded to minimize confounding factors.

Intervention:

Participants underwent a structured lifestyle modification program for six months. The dietary intervention consisted of a calorie-restricted plan ranging from 1200 to 1500 kcal/day, individualized based on baseline body weight and energy requirements. The diet emphasized balanced macronutrients, increased intake of whole grains, fruits, vegetables, and lean proteins, and limited consumption of refined sugars and saturated fats.

The exercise component involved moderate-intensity aerobic activities such as brisk walking, cycling, or swimming, totaling at least 150 minutes per week, supplemented with resistance training exercises twice weekly to enhance muscle strength and metabolic efficiency. Behavioral therapy sessions were conducted monthly, focusing on goal setting, motivation, adherence strategies, and overcoming barriers to lifestyle change. Participants were encouraged to maintain exercise and diet logs to monitor compliance, and regular follow-up visits were scheduled to provide guidance and reinforcement.

Duration of Study:

The intervention period was six months, with baseline assessments performed before initiation of the program and follow-up evaluations at the end of the study. This duration was chosen based on prior evidence suggesting that even modest weight loss over 3–6 months can produce significant improvements in metabolic, hormonal, and reproductive parameters in women with PCOS.

Outcome Measures and Data Collection:

Primary outcomes included changes in anthropometric measures (weight, body mass index [BMI], waist circumference), metabolic parameters (fasting blood glucose, fasting insulin, lipid profile, HOMA-IR), hormonal markers (serum total testosterone, LH, FSH, LH/FSH ratio, SHBG), and reproductive outcomes (menstrual cycle regularity and ovulation). Secondary outcomes included changes in clinical symptoms of hyperandrogenism, such as hirsutism and acne. Blood samples were collected after an overnight fast, and ultrasound examinations were performed to assess ovarian morphology.

Lifestyle Intervention Program

The lifestyle intervention program was designed as a comprehensive, multidimensional approach to address the metabolic, hormonal, and reproductive disturbances in women with PCOS. The program consisted of three major components: dietary modification, physical activity, and behavioral therapy.

Dietary Modification:

Participants were prescribed a calorie-restricted diet ranging from 1200 to 1500 kcal/day, tailored to individual energy requirements and baseline body weight. The diet emphasized consumption of low glycemic index (GI) carbohydrates to improve insulin sensitivity and reduce postprandial glucose spikes. Fiber intake was increased through fruits, vegetables, and whole grains to promote satiety, enhance gut health, and support weight management. Saturated fat intake was limited, while lean proteins and healthy fats were encouraged to maintain nutritional balance and support metabolic health. The dietary plan was reinforced with regular follow-up and individualized counseling to ensure adherence.

Physical Activity:

Participants were instructed to engage in at least 150 minutes per week of moderate-intensity physical activity, combining both aerobic and resistance exercises. Aerobic activities included brisk walking, cycling, or swimming to improve cardiovascular fitness and promote weight reduction. Resistance training was incorporated to increase lean muscle mass, enhance basal metabolic rate, and improve insulin sensitivity. Exercise sessions were structured and supervised when possible, with guidance on safe techniques and progressive intensity adjustments.

Behavioral Therapy:

Behavioral counseling sessions were conducted monthly to provide motivation, goal setting, and strategies to overcome barriers to lifestyle changes. Stress management techniques, including relaxation exercises, mindfulness, and coping strategies, were incorporated to mitigate the negative impact of stress on metabolic and reproductive function. Participants were also provided with guidance on sleep hygiene, recognizing the importance of adequate and regular sleep in regulating hormonal balance and metabolic health.

Statistical Analysis:

Data were analyzed using SPSS version 26. Continuous variables were expressed as mean $\pm$ standard deviation (SD). Paired t-tests were used to compare pre- and post-intervention values within the same participants. A p-value of ≤ 0.05 was considered statistically significant, indicating that the observed changes were unlikely to have occurred by chance.

This statistical approach allowed evaluation of the effectiveness of the structured lifestyle modification program on multiple metabolic, hormonal, and reproductive outcomes.

Results

The six-month structured lifestyle intervention led to significant improvements in anthropometric, hormonal, and metabolic parameters among women with PCOS.

Baseline Characteristics

Mean age: 26.4 ± 4.1 years

Mean BMI: 31.2 ± 3.8 kg/m²

Table 1: Anthropometric Changes

Parameter	Baseline	After 6 Months	p-value
BMI (kg/m²)	31.2 ± 3.8	27.9 ± 3.2	<0.001
Waist Circumference (cm)	96 ± 8	88 ± 7	<0.001

Table 2: Hormonal and Metabolic Changes

Parameter	Baseline	After 6 Months	p-value
Fasting Insulin (µIU/mL)	18.5 ± 4.2	12.3 ± 3.5	0.002
Serum Testosterone (ng/dL)	72 ± 15	55 ± 12	0.01
HDL (mg/dL)	38 ± 6	45 ± 7	0.01

Clinical Outcomes

65% achieved menstrual regularity

Ovulation restored in 58%

10% achieved spontaneous pregnancy

Summary:

Overall, the results indicate that a combination of calorie restriction, structured exercise, and behavioral therapy over six months significantly improves body composition, hormonal balance, and metabolic parameters in women with PCOS. These findings support the efficacy of lifestyle modification as a first-line, non-pharmacological intervention for managing both reproductive and metabolic aspects of the syndrome.

DISCUSSION

The findings of this study demonstrate that structured lifestyle modification has a significant positive impact on both metabolic and reproductive outcomes in women with polycystic ovary syndrome (PCOS). The observed reduction in body mass index (BMI) and waist circumference highlights the effectiveness of a combined approach involving dietary control, regular exercise, and behavioral support. Weight loss, even of a modest 5–10% of total body weight, is known to improve insulin sensitivity, decrease circulating insulin levels, and subsequently reduce androgen production by the ovaries. In our study, the significant decline in fasting insulin and HOMA-IR values confirms improved insulin sensitivity, which is a central therapeutic target in PCOS management.

Dietary modification, particularly the use of low glycemic index foods and increased fiber intake, likely contributed to reductions in postprandial glucose spikes and systemic inflammation, both of which are

implicated in the pathogenesis of PCOS. Calorie restriction combined with balanced macronutrient intake may have improved metabolic flexibility and facilitated weight loss, further reinforcing the beneficial effects on hormonal regulation. Reduced serum testosterone levels observed in this study are consistent with prior evidence showing that improved insulin sensitivity can suppress ovarian androgen synthesis and increase sex hormone-binding globulin (SHBG), thereby lowering free androgen levels.

Physical activity played a complementary role by enhancing glucose uptake in skeletal muscle, increasing energy expenditure, and promoting lean body mass. The combination of aerobic and resistance training not only supports weight reduction but also improves cardiovascular fitness, lipid profile, and overall metabolic health. The increase in high-density lipoprotein (HDL) levels observed in our participants reflects the cardiometabolic benefits of regular

structured exercise and underscores its importance in reducing long-term cardiovascular risk in women with PCOS.

The reproductive benefits of lifestyle modification were also evident. Improved menstrual regularity and higher ovulation rates suggest restoration of hypothalamic-pituitary-ovarian axis function. Weight loss and reduced hyperinsulinemia alleviate the inhibitory effects of insulin on follicular development and ovulation, leading to improved fertility outcomes. Additionally, behavioral counseling, stress management, and guidance on sleep hygiene may have contributed indirectly to reproductive improvements, as chronic stress and sleep disturbances are known to exacerbate hormonal imbalance in PCOS.

Overall, the results of this study align with current literature emphasizing lifestyle intervention as the first-line therapy for PCOS. The combination of diet, exercise, and behavioral support addresses the multifactorial pathophysiology of the syndrome, targeting insulin resistance, hyperandrogenism, and obesity simultaneously. These findings reinforce the notion that non-pharmacological strategies can produce clinically meaningful improvements in both metabolic and reproductive health, reducing the need for immediate pharmacologic intervention and promoting long-term well-being.

Furthermore, the improvements observed in this study highlight the importance of patient adherence and long-term sustainability of lifestyle changes. Regular follow-up, individualized counseling, and behavioral support were critical in ensuring compliance with dietary and exercise recommendations. This structured approach not only facilitated measurable short-term benefits but also fostered habits that can help maintain weight loss, improve insulin sensitivity, and regulate reproductive function over time. The study underscores that lifestyle modification is not merely an adjunctive therapy but a cornerstone in the management of PCOS, with the potential to prevent long-term complications such as type 2 diabetes, cardiovascular disease, and endometrial hyperplasia.

CONCLUSION

This study demonstrates that structured lifestyle intervention is highly effective in improving both metabolic and reproductive outcomes in women with polycystic ovary syndrome (PCOS). Over a six-month period, the combination of calorie-restricted diet, regular moderate-intensity exercise, and behavioral therapy led to significant reductions in body mass index (BMI) and waist circumference, improvements in insulin sensitivity, and decreases in serum testosterone levels. These changes not only address

the underlying pathophysiology of PCOS but also reduce the risk of long-term metabolic complications, including type 2 diabetes, dyslipidemia, and cardiovascular disease.

Reproductive benefits were also notable, with enhanced menstrual regularity and improved ovulation rates observed among participants. These outcomes highlight the direct effect of weight loss and improved insulin sensitivity on the hypothalamic-pituitary-ovarian axis, leading to restoration of ovulatory function and reduction of hyperandrogenic symptoms. Additionally, the integration of behavioral counseling, stress management, and sleep hygiene guidance reinforced adherence to lifestyle changes, emphasizing the importance of a holistic, multidisciplinary approach to management.

Given these findings, lifestyle modification should be implemented as the first-line therapy for women with PCOS, regardless of weight status, as it addresses both metabolic and reproductive abnormalities simultaneously. Early initiation of structured programs can prevent progression of metabolic dysfunction, improve quality of life, and reduce reliance on pharmacological interventions. Overall, this study reinforces that sustainable lifestyle interventions represent a safe, cost-effective, and evidence-based cornerstone in the management of PCOS, with long-term benefits extending beyond symptom control to overall health and well-being.

BIBLIOGRAPHY

1. Rotterdam ESHRE/ASRM-Sponsored PCOS consensus workshop group. *Fertil Steril*. 2004;81(1):19–25. DOI: 10.1016/j.fertnstert.2003.10.004
2. Teede HJ, et al. *Hum Reprod*. 2018;33(9):1602–1618. DOI:10.1093/humrep/dey256
3. Legro RS, et al. *Endocr Rev*. 2013;34(3):377–412. DOI: 10.1210/er.2012-1036
4. Moran LJ, et al. *Cochrane Database Syst Rev*. 2011;(7):CD007506. DOI:10.1002/14651858.CD007506.pub3
5. Hoeger KM. *J Clin Endocrinol Metab*. 2006;91(10):3864–3870.
6. Pasquali R, et al. *Lancet Diabetes Endocrinol*. 2016;4(9):723–735. DOI:10.1016/S2213-8587(16)30042-0
7. Lim SS, et al. *Hum Reprod Update*. 2012;18(6):618–637. DOI:10.1093/humupd/dms030
8. Thomson RL, et al. *Fertil Steril*. 2008;90(6):2184–2191.
9. Moran LJ, et al. *Hum Reprod Update*. 2009;15(2):149–161. DOI:10.1093/humupd/dmn053
10. Barber TM, et al. *Clin Endocrinol*. 2019;91(4):479–488.

- DOI:10.1111/cen.14015
11. Azziz R, et al. *J Clin Endocrinol Metab*. 2009;94(11):4565–4575. DOI:10.1210/jc.2009-1231
 12. Dumesic DA, et al. *Nat Rev Endocrinol*. 2015;11(7):429–441. DOI:10.1038/nrendo.2015.58
 13. Tang T, et al. *Hum Reprod Update*. 2010;16(3):280–292. DOI:10.1093/humupd/dmp051
 14. Hoeger KM, et al. *Fertil Steril*. 2004;82(Suppl 3):S37–S39. DOI:10.1016/j.fertnstert.2004.06.010
 15. Wild RA, et al. *J Clin Endocrinol Metab*. 2010;95(5):2038–2049. DOI:10.1210/jc.2009-2724
 16. Dokras A. *Fertil Steril*. 2012;97(2):313–321. DOI:10.1016/j.fertnstert.2011.11.045
 17. Hutchison SK, et al. *Obes Rev*. 2011;12(5):e492–e515.
 18. Joham AE, et al. *Hum Reprod Update*. 2015;21(4):475–495. DOI:10.1093/humupd/dmv017
 19. Moran LJ, et al. *Am J Clin Nutr*. 2003;78(2):362–369.
 20. Teede HJ, et al. *Clin Endocrinol*. 2011;75(6):783–789. DOI:10.1111/j.1365-2265.2011.04145.x