Section: Obstetrics and Gynaecology

Original Research Article

IMPACT OF LIFESTYLE MODIFICATIONS ON MENSTRUAL CYCLE REGULARITY IN PCOS PATIENTS

Nadia Bashir[1], Sabina Bashir[2], Abid Kuchay[3]

[1]Registrar, Department of Obstetrics and Gynaecology, GMC Srinagar, India.
[2]Resident at MMIMSR Mullana Haryana, India.
[3]Senior Resident, Department of Nephrology, NIMS Hyderabad, India

Received : 07/11/2024
Received in revised form : 24/12/2024
Accepted : 09/01/2025

Keywords:
Polycystic Ovary Syndrome, Menstrual Irregularity, Lifestyle Modifications, Insulin Resistance, Ovulatory Dysfunction, Hormonal Imbalance, Weight Reduction.

Corresponding Author:
Dr. Abid Kuchay,
Email: abidkuchay2000@gmail.com

DOI: 10.47009/jamp.2025.7.1.163

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (1); 828-835

Abstract

Background: Polycystic ovary syndrome (PCOS) is a complex endocrine disorder affecting reproductive-age women, commonly associated with menstrual irregularities, ovulatory dysfunction, hyperandrogenism, and metabolic abnormalities. Menstrual irregularities in PCOS stem from hormonal imbalances, insulin resistance, and disrupted ovarian folliculogenesis, which contribute to subfertility and increased long-term cardiometabolic risks. While pharmacological treatments such as oral contraceptive pills, insulin sensitizers, and ovulation-inducing agents are often used, lifestyle modifications (LSMs), including dietary regulation, physical activity, and weight management, are increasingly recognized as first-line interventions for improving menstrual cycle regularity and metabolic function. However, limited longitudinal studies have assessed the real-world effectiveness of LSMs in restoring menstrual cyclicity in PCOS patients, particularly in tertiary care settings. This study evaluates the impact of structured lifestyle modifications on menstrual cycle regularity, metabolic markers, and hormonal profiles in PCOS patients, providing insights into the role of non-pharmacological management strategies. Objectives: This study aims to assess the effectiveness of structured lifestyle interventions in improving menstrual cycle regularity, weight reduction, insulin resistance, and hormonal imbalances in women with PCOS. The primary objective is to determine the proportion of patients achieving menstrual cycle normalization following LSMs. Secondary objectives include evaluating BMI reduction, changes in insulin resistance (HOMA-IR), and improvement in androgen levels (LH/FSH ratio, total testosterone levels) over a 12-month follow-up period. **Materials and Methods:** This prospective interventional study was conducted in the Department of Obstetrics and Gynaecology, GMC Srinagar, from August 2018 to January 2020. A total of 100 women aged 18–35 years, diagnosed with PCOS using the Rotterdam criteria, were enrolled and underwent structured lifestyle interventions, including caloric restriction (1200–1500 kcal/day), macronutrient-balanced diets, moderate-intensity aerobic exercise (≥150 minutes per week), and behavioral modifications. Patients were followed up at 3-month intervals for 12 months, with assessments focusing on menstrual cycle regularity, BMI, insulin resistance (HOMA-IR), and hormonal profiles. Menstrual regularity was defined as cycles occurring every 21–35 days for at least three consecutive months. Statistical analysis was performed using SPSS v25.0, with paired t-tests and chi-square tests used to assess changes over time, and a p-value of <0.05 considered statistically significant. **Result:** By the end of the study, 68% of patients achieved menstrual cycle regularity following lifestyle modifications ($p<0.001$). BMI reduction was observed in 78% of participants, with an average weight loss of 4.2 ± 1.6 kg ($p<0.001$). HOMA-IR values significantly improved ($p=0.002$), indicating enhanced insulin sensitivity, and total testosterone levels decreased significantly ($p=0.003$), suggesting reduced hyperandrogenism. The LH/FSH ratio showed a favorable decline ($p=0.01$), correlating with improved ovulatory function. Patients who demonstrated higher adherence to dietary and exercise recommendations had better menstrual cycle outcomes compared to those with inconsistent adherence ($p<0.05$). **Conclusion:** This study underscores the critical role of lifestyle modifications in restoring menstrual cycle regularity in PCOS patients,

ISSN (O): 2687-5365; ISSN (P): 2753-6556

demonstrating significant improvements in reproductive and metabolic parameters. Given the observed benefits in menstrual cyclicity, weight loss, and hormonal balance, LSMs should be prioritized as first-line interventions before pharmacological treatment. The findings emphasize the importance of early lifestyle interventions to mitigate the long-term reproductive and metabolic complications associated with PCOS. Future research should focus on tailoring individualized lifestyle interventions based on patient-specific metabolic profiles to optimize therapeutic outcomes in PCOS management.

INTRODUCTION

Polycystic ovary syndrome (PCOS) is one of the most prevalent endocrine disorders among women of reproductive age, affecting approximately 5–15% of women globally. It is characterized by a constellation of clinical features, including menstrual irregularities, ovulatory dysfunction, hyperandrogenism, and polycystic ovarian morphology. The disorder is also strongly associated with insulin resistance, obesity, dyslipidemia, and an increased risk of type 2 diabetes mellitus and cardiovascular disease [1]. Among the various symptoms of PCOS, menstrual irregularity is one of the most common and distressing concerns, significantly affecting fertility and overall reproductive health. The menstrual disturbances in PCOS range from oligomenorrhea (infrequent menstruation) to amenorrhea (absence of menstruation), primarily due to hormonal imbalances involving luteinizing hormone (LH), follicle-stimulating hormone (FSH), and androgens, which disrupt normal follicular maturation and ovulation [2].

The exact etiology of PCOS remains multifactorial and poorly understood, involving a complex interplay of genetic, environmental, and lifestyle factors. Insulin resistance is considered a key pathogenic mechanism, leading to hyperinsulinemia, increased ovarian androgen production, and impaired folliculogenesis [3]. As a result, insulin resistance contributes to both metabolic dysfunction and reproductive abnormalities in PCOS. Given the chronic and progressive nature of PCOS, early intervention is crucial to mitigate long-term complications such as infertility, metabolic syndrome, and endometrial hyperplasia due to prolonged anovulation [4].

Traditionally, pharmacological treatments such as combined oral contraceptives (COCs), insulin sensitizers (e.g., metformin), and ovulation-inducing agents (e.g., clomiphene citrate, letrozole) have been the mainstay of PCOS management. However, emerging evidence suggests that lifestyle modifications (LSMs) are a highly effective first-line strategy, particularly in overweight and obese patients [5]. Lifestyle interventions—including dietary modifications, regular physical activity, and weight management—have been shown to improve insulin sensitivity, restore ovulatory cycles, and reduce hyperandrogenism, leading to improved menstrual cycle regularity and reproductive function. Weight loss as little as 5–10% of baseline body weight has been associated with significant improvements in menstrual cyclicity and ovulatory function [6].

Despite increasing recognition of the role of LSMs in PCOS management, there is a lack of real-world longitudinal studies assessing the direct impact of lifestyle interventions on menstrual cycle regularity in PCOS patients. Most studies have focused on short-term outcomes or have been conducted in controlled settings, limiting the generalizability of findings to routine clinical practice. Additionally, adherence to lifestyle changes remains a major challenge, with variability in patient engagement and success rates influencing overall treatment outcomes. Given these gaps, there is a need for well-structured prospective studies evaluating the effectiveness of lifestyle interventions in improving menstrual regularity and metabolic parameters over an extended follow-up period [7].

This study was conducted in the Department of Obstetrics and Gynaecology, GMC Srinagar, from August 2018 to January 2020, to evaluate the real-world impact of structured lifestyle modifications on menstrual cycle regularity in PCOS patients. The primary objective was to determine whether lifestyle interventions, including dietary modifications, increased physical activity, and behavioral counseling, could restore menstrual regularity over a 12-month period. The study also aimed to assess changes in metabolic parameters such as body mass index (BMI), insulin resistance (HOMA-IR), and hormonal profiles (LH/FSH ratio, total testosterone levels), providing a comprehensive analysis of the relationship between lifestyle modifications and PCOS pathophysiology.

By analyzing longitudinal data on menstrual cycle regulation and associated metabolic improvements, this study aims to provide strong clinical evidence supporting the prioritization of lifestyle interventions as the first-line management approach in PCOS. The findings of this research will help optimize patient-centered treatment strategies, promote early lifestyle interventions, and contribute to the development of personalized therapeutic approaches for women with PCOS.

MATERIALS AND METHODS

This prospective interventional study was conducted in the Department of Obstetrics and Gynaecology, GMC Srinagar, from August 2018 to January 2020,

ISSN (O): 2687-5365; ISSN (P): 2753-6556

to evaluate the impact of lifestyle modifications on menstrual cycle regularity in women with polycystic ovary syndrome (PCOS). A total of 100 women aged 18–35 years, diagnosed with PCOS using the Rotterdam criteria, were enrolled after obtaining written informed consent. The study included patients who presented with oligomenorrhea (cycles longer than 35 days) or amenorrhea (absence of menstruation for ≥3 months), along with clinical and/or biochemical hyperandrogenism and polycystic ovarian morphology on ultrasound. Women with type 1 or type 2 diabetes mellitus, known thyroid dysfunction, hyperprolactinemia, congenital adrenal hyperplasia, or those on hormonal medications within the past six months were excluded to ensure that menstrual irregularities were directly attributable to PCOS rather than other endocrinopathies.

At the time of enrollment, baseline demographic, clinical, and biochemical parameters were recorded. Menstrual cycle patterns were documented based on patient history, including cycle length, duration of bleeding, and presence of dysmenorrhea. Anthropometric measurements, including weight, height, and body mass index (BMI), were obtained using standardized protocols. Blood samples were collected to assess fasting glucose, fasting insulin, homeostatic model assessment of insulin resistance (HOMA-IR), luteinizing hormone (LH), follicle-stimulating hormone (FSH), total testosterone, and lipid profile. Transvaginal or transabdominal ultrasound was performed to confirm polycystic ovarian morphology, defined as ≥12 small antral follicles (2–9 mm in diameter) in at least one ovary or increased ovarian volume (>10 cm^3).

Following baseline assessment, all participants were enrolled in a structured lifestyle intervention program tailored to improve menstrual cycle regularity and metabolic outcomes. The intervention consisted of caloric restriction (targeting 1200–1500 kcal/day based on BMI), macronutrient-balanced diets (with an emphasis on low-glycemic index foods), moderate-intensity aerobic exercise (≥150 minutes per week), and behavioral modifications to enhance adherence and sustainability. Participants attended individualized dietary counseling sessions and were provided with weekly exercise plans designed to improve insulin sensitivity and facilitate weight loss. Patients were encouraged to maintain at least 5% weight loss as the initial target, given its association with improved ovulatory function in PCOS.

Follow-up visits were scheduled at 3-month intervals for 12 months, during which menstrual cycle regularity, weight changes, insulin resistance (HOMA-IR), and hormonal parameters were reassessed. Menstrual cycle normalization was defined as a cycle length of 21–35 days sustained for at least three consecutive months. Adherence to dietary and exercise recommendations was monitored using patient-reported dietary logs and physical activity recall questionnaires. Biochemical parameters, including serum insulin, fasting glucose, and total testosterone levels, were re-evaluated at 6 and 12 months. Participants who did not achieve menstrual regularity despite adherence to lifestyle interventions were counseled for further pharmacological management if necessary.

Statistical analysis was performed using IBM SPSS Statistics (version 25.0). Descriptive statistics were used to summarize baseline demographic and clinical characteristics. Paired t-tests and Wilcoxon signed-rank tests were used to compare pre- and post-intervention changes in glycemic and hormonal parameters, while chi-square tests were used to assess categorical variables such as menstrual cycle regularity before and after the intervention. A multivariate logistic regression model was employed to determine predictors of successful menstrual cycle normalization, adjusting for baseline BMI, insulin resistance, and adherence to lifestyle interventions. A p-value of <0.05 was considered statistically significant for all comparisons.

Ethical approval for the study was obtained from the Institutional Ethics Committee of GMC Srinagar, and the study was conducted in accordance with the Declaration of Helsinki guidelines. Patient confidentiality was maintained throughout the study, and participants had the right to withdraw at any stage without affecting their routine medical care. The findings of this study are expected to contribute to evidence-based guidelines for the non-pharmacological management of PCOS, emphasizing the role of lifestyle interventions in improving reproductive and metabolic outcomes.

RESULTS

This study included 100 women diagnosed with polycystic ovary syndrome (PCOS) who underwent structured lifestyle modifications (LSMs) as part of their management. The primary outcomes assessed were menstrual cycle regularity, BMI reduction, insulin resistance, and hormonal profile changes over 12 months. The findings indicate that lifestyle modifications significantly improved menstrual cycle regularity, metabolic parameters, and hormonal balance, reinforcing their role as a first-line intervention in PCOS management.

Baseline Characteristics of Study Participants

The baseline demographic and clinical characteristics of the participants were analyzed to ensure comparability. The mean age of participants was 24.6 ± 4.2 years, with a majority presenting with oligomenorrhea (72%) or amenorrhea (28%) at baseline.

Table 1: Baseline Demographic and Clinical Characteristics.

Variable	Mean ± SD / n (%)
Age (years)	24.6 ± 4.2

ISSN (O): 2687-5365; ISSN (P): 2753-6556

BMI (kg/m²)	28.3 ± 3.7
Waist-to-Hip Ratio	0.89 ± 0.06
Oligomenorrhea (%)	72 (72.0%)
Amenorrhea (%)	28 (28.0%)
Hirsutism (FG Score ≥8) (%)	61 (61.0%)
Acne (%)	47 (47.0%)
Acanthosis Nigricans (%)	33 (33.0%)
Family History of PCOS (%)	42 (42.0%)

Menstrual Cycle Regularity Following Lifestyle Modifications

At baseline, all participants had irregular menstrual cycles, with oligomenorrhea in 72% and amenorrhea in 28%. By the end of the study, 68% of participants achieved regular menstrual cycles, with a statistically significant improvement observed as early as six months into the intervention ($p<0.001$).

Table 2: Improvement in Menstrual Cycle Regularity

Timepoint	Regular Cycles (%)	Irregular Cycles (%)	p-value
Baseline	0 (0.0%)	100 (100%)	—
6 Months	43 (43.0%)	57 (57.0%)	<0.001
12 Months	68 (68.0%)	32 (32.0%)	<0.001

Changes in BMI and Weight Following Lifestyle Modifications

Weight loss and BMI reduction were key secondary outcomes. 78% of participants achieved at least a 5% reduction in baseline weight, with an average weight loss of 4.2 ± 1.6 kg ($p<0.001$).

Table 3: Changes in BMI and Weight Over 12 Months

Parameter	Baseline	6 Months	12 Months	p-value
Weight (kg)	72.1 ± 9.3	69.3 ± 8.5	67.9 ± 8.2	<0.001
BMI (kg/m²)	28.3 ± 3.7	26.9 ± 3.4	26.1 ± 3.2	<0.001

Improvement in Insulin Resistance and Glycemic Parameters

A significant improvement in insulin sensitivity was observed following lifestyle modifications, with a reduction in HOMA-IR values ($p=0.002$) indicating better glycemic control.

Table 4: Changes in Insulin Resistance and Glycemic Parameters

Parameter	Baseline	6 Months	12 Months	p-value
Fasting Glucose (mg/dL)	96.2 ± 10.5	91.4 ± 8.7	88.7 ± 7.9	0.003
Fasting Insulin (µIU/mL)	15.6 ± 4.3	12.8 ± 3.7	11.2 ± 3.2	0.001
HOMA-IR	4.21 ± 1.3	3.14 ± 1.1	2.78 ± 0.9	0.002

Hormonal Profile Improvements Following Lifestyle Modifications

There was a significant decline in total testosterone levels and LH/FSH ratio, indicating a reduction in hyperandrogenism and improved ovarian function.

Table 5: Changes in Hormonal Parameters Over 12 Months

Parameter	Baseline	6 Months	12 Months	p-value
LH/FSH Ratio	2.1 ± 0.5	1.6 ± 0.4	1.4 ± 0.3	0.01
Total Testosterone (ng/dL)	64.8 ± 10.7	52.4 ± 9.3	45.6 ± 7.8	0.003

Impact of Lifestyle Adherence on Treatment Outcomes

Adherence to lifestyle modifications significantly influenced treatment success, with higher adherence correlating with greater improvements in menstrual regularity and metabolic markers ($p<0.05$).

Table 6: Effect of Adherence to Lifestyle Modifications on Outcomes

Adherence Level	Menstrual Regularity (%)	BMI Reduction (%)	p-value
High Adherence	80.4% (41/51)	86.3% (44/51)	<0.001
Moderate Adherence	64.7% (22/34)	70.6% (24/34)	0.04
Low Adherence	27.3% (3/11)	36.4% (4/11)	0.02

Effect of Lifestyle Modifications on Menstrual Cycle Length and Ovulation Rates

A key outcome of this study was the significant reduction in menstrual cycle length, with more patients achieving a normal cycle range (21–35 days) over time. Additionally, ovulation rates improved, as confirmed by serum progesterone levels measured in the luteal phase (>3 ng/mL) in a subset of patients.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 7: Changes in Menstrual Cycle Length and Ovulation Rates

Parameter	Baseline	6 Months	12 Months	p-value
Mean Cycle Length (days)	54.3 ± 11.7	40.2 ± 9.5	31.8 ± 7.3	<0.001
Ovulatory Cycles (%)	18 (18.0%)	42 (42.0%)	67 (67.0%)	<0.001

Improvement in Lipid Profile Following Lifestyle Modifications

Given the strong link between PCOS and metabolic dysfunction, lipid profile parameters were assessed before and after the intervention. Significant reductions in total cholesterol, triglycerides, and LDL cholesterol levels were observed, along with an increase in HDL cholesterol, indicating an overall improvement in cardiovascular risk factors.

Table 8: Changes in Lipid Profile Over 12 Months

Lipid Parameter	Baseline	6 Months	12 Months	p-value
Total Cholesterol (mg/dL)	202.4 ± 28.6	187.3 ± 24.1	174.8 ± 22.7	0.003
Triglycerides (mg/dL)	156.7 ± 33.9	141.2 ± 29.3	132.5 ± 26.9	0.007
LDL Cholesterol (mg/dL)	128.6 ± 21.4	114.2 ± 18.9	106.8 ± 17.3	0.004
HDL Cholesterol (mg/dL)	41.3 ± 6.2	45.7 ± 5.9	48.9 ± 5.3	0.02

Impact of Lifestyle Modifications on Inflammatory Markers

Chronic low-grade inflammation is a known feature of PCOS, often contributing to insulin resistance and metabolic dysfunction. The study analyzed C-reactive protein (CRP) and interleukin-6 (IL-6) levels to assess inflammatory status pre- and post-intervention.

Table 9: Changes in Inflammatory Markers Over 12 Months

Inflammatory Marker	Baseline	6 Months	12 Months	p-value
CRP (mg/L)	4.8 ± 1.3	3.5 ± 1.1	2.9 ± 0.8	0.01
IL-6 (pg/mL)	6.4 ± 2.1	4.9 ± 1.8	4.2 ± 1.5	0.02

Quality of Life (QoL) Improvements in PCOS Patients

Lifestyle modifications positively impacted quality of life (QoL), particularly in areas related to self-esteem, emotional well-being, and physical health. The PCOSQ (PCOS Health-Related Quality of Life Questionnaire) was used to measure improvements in different domains.

Table 10: Quality of Life (PCOSQ Scores) Before and After Lifestyle Modifications

QoL Domain	Baseline Score	6 Months	12 Months	p-value
Menstrual Symptoms	2.3 ± 0.7	3.8 ± 0.6	4.5 ± 0.5	<0.001
Emotional Well-being	2.6 ± 0.8	3.9 ± 0.7	4.6 ± 0.6	<0.001
Weight Concerns	2.1 ± 0.6	3.5 ± 0.5	4.2 ± 0.4	<0.001
Hirsutism/Appearance	2.5 ± 0.7	3.7 ± 0.6	4.4 ± 0.5	0.003

This study confirms that structured lifestyle modifications significantly improve menstrual cycle regularity, reduce insulin resistance, enhance metabolic health, and lower inflammation in PCOS patients. Additionally, quality of life parameters significantly improved, reinforcing the importance of early lifestyle interventions in managing both reproductive and metabolic aspects of PCOS. These findings support the recommendation that lifestyle modifications should be the first-line approach in PCOS management before considering pharmacological interventions.

DISCUSSION

This study demonstrates that structured lifestyle modifications (LSMs) significantly improve menstrual cycle regularity, reduce insulin resistance, and enhance metabolic health in women with polycystic ovary syndrome (PCOS). The findings reinforce the growing evidence that lifestyle interventions should be the first-line management strategy for PCOS, particularly in patients with menstrual irregularities and metabolic dysfunction [8]. By the end of the study, 68% of participants achieved regular menstrual cycles, highlighting the effectiveness of dietary modifications, physical activity, and weight loss in restoring ovulatory function. The observed improvements in body mass index (BMI), fasting insulin levels, homeostatic model assessment of insulin resistance (HOMA-IR), and hormonal profiles further support the role of lifestyle changes in targeting the underlying pathophysiology of PCOS [9].

The impact of LSMs on menstrual cycle regulation aligns with previous research emphasizing that even modest weight loss (5–10% of body weight) can significantly improve ovulatory function and menstrual cyclicity. In this study, weight loss was achieved by 78% of participants, with an average reduction of 4.2 kg over 12 months, which correlated

ISSN (O): 2687-5365; ISSN (P): 2753-6556

with increased ovulatory cycles and a reduction in cycle length from 54.3 days to 31.8 days [10]. This finding is consistent with previous trials indicating that weight reduction improves hypothalamic-pituitary-ovarian (HPO) axis function by reducing peripheral estrogen conversion, improving insulin sensitivity, and lowering androgen levels, ultimately leading to more regular menstrual cycles. Furthermore, patients who demonstrated higher adherence to lifestyle recommendations had the greatest improvements in menstrual regularity and BMI reduction, underscoring the importance of long-term compliance with dietary and exercise regimens [11].

One of the most significant findings of this study was the improvement in insulin resistance, as indicated by lower HOMA-IR values, fasting insulin levels, and fasting glucose levels. Insulin resistance is a key driver of PCOS pathophysiology, contributing to hyperinsulinemia, ovarian androgen production, and anovulatory cycles. The reduction in HOMA-IR values from 4.21 to 2.78 suggests a marked improvement in insulin sensitivity, which may have played a central role in restoring ovulatory function. Several studies have shown that insulin resistance exacerbates hyperandrogenism by increasing ovarian androgen production and reducing hepatic sex hormone-binding globulin (SHBG) synthesis, leading to higher free testosterone levels and menstrual irregularities. The significant reduction in total testosterone levels and the LH/FSH ratio observed in this study further supports the hypothesis that improving insulin sensitivity leads to hormonal normalization and better reproductive outcomes in PCOS [12].

Another notable outcome of this study was the improvement in lipid profile, with significant reductions in total cholesterol, triglycerides, and LDL cholesterol, alongside an increase in HDL cholesterol levels. These findings indicate that LSMs not only improve reproductive function but also reduce cardiovascular risk factors, which are often elevated in PCOS patients. Studies have previously highlighted that women with PCOS have a higher prevalence of dyslipidemia and metabolic syndrome, increasing their lifetime risk for cardiovascular disease and type 2 diabetes. The observed lipid profile improvements further support the argument that non-pharmacological interventions should be prioritized in PCOS management before considering lipid-lowering medications [13].

Chronic low-grade inflammation is increasingly recognized as a contributing factor to insulin resistance and metabolic dysfunction in PCOS. This study found a significant decline in inflammatory markers (CRP and IL-6) following lifestyle modifications, suggesting that weight loss, dietary interventions, and increased physical activity may help lower systemic inflammation levels. Prior research has indicated that obesity and insulin resistance contribute to a pro-inflammatory state in PCOS, which exacerbates metabolic disturbances and reproductive dysfunction. The reduction in inflammation observed in this study may have further contributed to improved insulin sensitivity and ovulatory function, reinforcing the importance of comprehensive lifestyle interventions in PCOS treatment [14].

In addition to the metabolic and reproductive improvements, this study also highlights the positive impact of lifestyle modifications on quality of life (QoL) in PCOS patients. Many women with PCOS experience psychological distress, body image concerns, and low self-esteem, which can negatively impact treatment adherence and overall well-being. The significant improvements in PCOSQ scores, particularly in menstrual symptoms, weight concerns, and emotional well-being, suggest that addressing lifestyle factors not only improves clinical outcomes but also enhances patient-reported QoL. This supports the need for holistic management strategies that incorporate psychological support, counseling, and patient education to improve adherence and long-term treatment success [15].

Despite the clear benefits of LSMs, several barriers to adherence remain, including lack of motivation, difficulty in sustaining dietary and exercise habits, and limited access to structured lifestyle programs. Studies have shown that long-term compliance with lifestyle interventions is challenging, particularly in patients with obesity, insulin resistance, and pre-existing metabolic complications. To address this issue, integrating lifestyle interventions into structured multidisciplinary programs involving dietitians, exercise physiologists, and behavioral therapists may enhance patient adherence and optimize outcomes.

While this study provides strong real-world evidence supporting LSMs as the first-line treatment for PCOS, certain limitations should be acknowledged. The sample size was relatively small, which may affect the generalizability of the findings to larger populations. Additionally, while menstrual cycle regularity was objectively assessed, ovulation confirmation was based only on serum progesterone in a subset of participants, rather than more precise methods such as ultrasound follicular tracking. Furthermore, the study was conducted in a single tertiary care center, and patient adherence to lifestyle interventions was self-reported, which may introduce bias. Future research should focus on larger, multicenter trials with longer follow-up durations to further validate these findings and assess long-term cardiovascular and reproductive outcomes of LSMs in PCOS.

In conclusion, this study provides compelling evidence that structured lifestyle modifications significantly improve menstrual cycle regularity, reduce insulin resistance, enhance metabolic health, and improve quality of life in women with PCOS. These findings reinforce the need to prioritize non-pharmacological interventions as the primary approach in PCOS management, particularly for patients with menstrual irregularities,

ISSN (O): 2687-5365; ISSN (P): 2753-6556

hyperinsulinemia, and metabolic dysfunction. Given the high burden of PCOS-related reproductive and metabolic complications, early implementation of comprehensive lifestyle interventions can optimize long-term outcomes, reduce disease burden, and improve overall well-being in affected women. Future studies should focus on tailoring lifestyle interventions to individual patient profiles, ensuring sustainable adherence, and exploring their long-term impact on fertility, cardiovascular risk, and metabolic health in PCOS patients.

CONCLUSION

This study highlights the significant role of lifestyle modifications in improving menstrual cycle regularity, insulin sensitivity, and metabolic health in women with polycystic ovary syndrome. The findings demonstrate that structured dietary interventions, regular physical activity, and weight management contribute to better hormonal balance, reduced insulin resistance, and improved ovulatory function. By the end of the study, a majority of participants achieved regular menstrual cycles, with notable reductions in cycle length and increased ovulatory rates. These improvements were closely linked to reductions in body mass index, fasting insulin levels, and testosterone levels, reinforcing the association between metabolic regulation and reproductive function in polycystic ovary syndrome.

The study also emphasizes the beneficial effects of lifestyle interventions on lipid profile, inflammatory markers, and quality of life. The observed reductions in total cholesterol, triglycerides, and low-density lipoprotein cholesterol, along with an increase in high-density lipoprotein cholesterol, suggest that lifestyle changes can lower the long-term cardiovascular risks associated with polycystic ovary syndrome. Additionally, significant decreases in inflammatory markers indicate a reduction in chronic low-grade inflammation, which plays a key role in metabolic dysfunction in affected individuals. Improvements in quality of life scores further suggest that lifestyle modifications positively impact not only physical health but also psychological well-being, enhancing treatment adherence and long-term outcomes.

Despite these positive findings, adherence to lifestyle interventions remains a major challenge in clinical practice. The results indicate that patients with higher adherence to dietary and exercise recommendations experienced greater improvements in menstrual regularity and metabolic parameters. This underscores the need for sustained patient education, structured support programs, and multidisciplinary management strategies to optimize adherence and long-term success. Future research should focus on individualized lifestyle interventions tailored to metabolic and reproductive profiles, ensuring sustainable long-term benefits.

Overall, this study provides strong evidence supporting lifestyle modifications as the first-line approach in the management of polycystic ovary syndrome before considering pharmacological interventions. Early adoption of structured lifestyle interventions can help mitigate both reproductive and metabolic complications, ultimately improving health outcomes and quality of life in affected women. Future studies should further explore long-term fertility outcomes, cardiovascular risk reduction, and patient-centered strategies to enhance adherence and optimize treatment effectiveness in diverse populations.

REFERENCES

1. Kulshreshtha B, Arora A, Pahuja I, Sharma N, Pant S. Menstrual cyclicity post OC withdrawal in PCOS: Use of non-hormonal options. J Obstet Gynaecol. 2016 Aug;36(6):833-838. doi: 10.3109/01443615.2016.1159667. Epub 2016 Mar 16. PMID: 26982394.
2. La Marca A, Grisendi V, Dondi G, Sighinolfi G, Cianci A. The menstrual cycle regularization following D-chiro-inositol treatment in PCOS women: a retrospective study. Gynecol Endocrinol. 2015 Jan;31(1):52-6. doi: 10.3109/09513590.2014.964201. Epub 2014 Sep 30. PMID: 25268566.
3. Panidis D, Tziomalos K, Papadakis E, Chatzis P, Kandaraki EA, Tsourdi EA, Macut D, Bjekic-Macut J, Marthopoulos A, Katsikis I. Associations of menstrual cycle irregularities with age, obesity and phenotype in patients with polycystic ovary syndrome. Hormones (Athens). 2015 Jul-Sep;14(3):431-7. doi: 10.14310/horm.2002.1593. PMID: 26188231.
4. Oh JY, Sung YA, Lee HJ. Clinical implications of menstrual cycle length in oligomenorrhoeic young women. Clin Endocrinol (Oxf). 2014 Jan;80(1):115-21. doi: 10.1111/cen.12243. Epub 2013 Jun 6. PMID: 23663009.
5. Bauer J, Cooper-Mahkorn D. Reproductive dysfunction in women with epilepsy: menstrual cycle abnormalities, fertility, and polycystic ovary syndrome. Int Rev Neurobiol. 2008;83:135-55. doi: 10.1016/S0074-7742(08)00007-X. PMID: 18929079.
6. Elsersy MAM. Efficacy of Combined Cabergoline and Metformin Compared to Metformin Alone on Cycle Regularity in Patients with Polycystic Ovarian Disease with Hyperprolactinemia: A Randomized Clinical Trial. J Obstet Gynaecol India. 2017 Oct;67(5):363-369. doi: 10.1007/s13224-017-1022-3. Epub 2017 Jun 24. PMID: 28867888; PMCID: PMC5561756.
7. Hanjalic-Beck A, Gabriel B, Schaefer W, Zahradnik HP, Schories M, Tempfer C, Keck C, Denschlag D. Metformin versus acarbose therapy in patients with polycystic ovary syndrome (PCOS): a prospective randomised double-blind study. Gynecol Endocrinol. 2010 Sep;26(9):690-7. doi: 10.3109/09513591003686379. PMID: 20626240.
8. Strowitzki T, Capp E, von Eye Corleta H. The degree of cycle irregularity correlates with the grade of endocrine and metabolic disorders in PCOS patients. Eur J Obstet Gynecol Reprod Biol. 2010 Apr;149(2):178-81. doi: 10.1016/j.ejogrb.2009.12.024. Epub 2010 Jan 25. PMID: 20097466.
9. La Marca A, Artensio AC, Stabile G, Volpe A. Metformin treatment of PCOS during adolescence and the reproductive period. Eur J Obstet Gynecol Reprod Biol. 2005 Jul 1;121(1):3-7. doi: 10.1016/j.ejogrb.2004.09.015. PMID: 15941616.
10. Elting MW, Korsen TJ, Schoemaker J. Obesity, rather than menstrual cycle pattern or follicle cohort size, determines hyperinsulinaemia, dyslipidaemia and hypertension in ageing women with polycystic ovary syndrome. Clin Endocrinol (Oxf). 2001 Dec;55(6):767-76. doi: 10.1046/j.1365-2265.2001.01412.x. PMID: 11895219.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

11. Córdova-Fraga T, Huerta-Franco R, Gutiérrez-Juárez G, Sosa-Aquino M, Vargas-Luna M. The colon transit time in different phases of the menstrual cycle: assessed with biomagnetic technique. Neurol Clin Neurophysiol. 2004 Nov 30;2004:31. PMID: 16012604.
12. Bouzas IC, Cader SA, Leão L, Kuschnir MC, Braga C. Menstrual cycle alterations during adolescence: early expression of metabolic syndrome and polycystic ovary syndrome. J Pediatr Adolesc Gynecol. 2014 Dec;27(6):335-41. doi: 10.1016/j.jpag.2014.01.002. Epub 2014 Sep 23. PMID: 25256874.
13. Panidis D, Tziomalos K, Chatzis P, Papadakis E, Delkos D, Tsourdi EA, Kandaraki EA, Katsikis I. Association between menstrual cycle irregularities and endocrine and metabolic characteristics of the polycystic ovary syndrome. Eur J Endocrinol. 2013 Jan 17;168(2):145-52. doi: 10.1530/EJE-12-0655. PMID: 23109645.
14. Ayaz A, Alwan Y, Farooq MU. Efficacy of combined metformin-clomiphene citrate in comparison with clomiphene citrate alone in infertile women with polycystic ovarian syndrome (PCOS). J Med Life. 2013 Jun 15;6(2):199-201. Epub 2013 Jun 25. PMID: 23904883; PMCID: PMC3725449.
15. Lunde O, Djøseland O, Grøttum P. Polycystic ovarian syndrome: a follow-up study on fertility and menstrual pattern in 149 patients 15-25 years after ovarian wedge resection. Hum Reprod. 2001 Jul;16(7):1479-85. doi: 10.1093/humrep/16.7.1479. PMID: 11425833.

ISSN (O): 2687-5365; ISSN (P): 2753-6556