

Lifestyle interventions and their impact on PCOS management

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ABSTRACT

Background: Polycystic Ovary Syndrome (PCOS) impacts 5–15% of females, leading to hormonal disruptions, insulin resistance, and difficulties in reproduction. Although combined lifestyle changes (diet and physical activity) enhance results, research is scarce in the context of Bangladesh. This research focuses on that gap by assessing how these lifestyle changes affect PCOS management specifically in Bangladesh. **Methods & Materials:** This planned interventional research (October 2024–September 2025) at Bangabandhu Medical University in Bangladesh involved 220 women (ages 18–35) diagnosed with PCOS using the Rotterdam criteria. Participants underwent lifestyle changes that included dietary adjustments, physical activity, and counseling. Outcomes (BMI, menstrual regularity, HOMA-IR, and hormonal profile) were evaluated at baseline and after 3 months. Data analysis was conducted with SPSS v25, deeming $p < 0.05$ as significant. **Results:** Among 220 women diagnosed with PCOS (average age 24.8 ± 4.6 years), 68.2% were categorized as overweight or obese, presenting prevalent menstrual irregularities and hyperandrogenism. Out of the 198 who finished the follow-up, 68.7% demonstrated good adherence. After 6 months, notable advancements were noted: weight (-4.6 kg), BMI (-1.8 kg/m²), waist size (-5.8 cm), and $\geq 5\%$ weight reduction (59.1%, $p < 0.05$). Menstrual regularity enhanced in 67.5%, with cycle length reducing from 45.2 ± 12.6 to 32.8 ± 6.4 days. Metabolic, hormonal, and clinical results also enhanced, particularly in the high-adherence group. **Conclusion:** A six-month lifestyle intervention greatly enhanced weight, metabolic, hormonal, and menstrual results in women with PCOS. Increased adherence correlated with enhanced benefits, emphasizing lifestyle changes as a successful primary management approach.

Keywords: PCOS, Lifestyle interventions, Menstrual pattern, BMI

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is the prevalent endocrine condition among women of reproductive age, impacting approximately 5–15% based on diagnostic standards. Initially, it was characterized by Stein and Leventhal as a syndrome marked by oligo-amenorrhea^[1,2]. It arises from a combination of genetic and environmental influences. An unhealthy way of living, poor diet, and infections raise the risk. Insulin resistance causes ovarian dysfunction and increased androgen levels, leading to anovulation. Hormonal disturbances related to GnRH, FSH, LH, and prolactin are also observed. Genetic influences, comprising potential genes, also play a role in its progression^[3,4]. PCOS is marked by irregular or missing periods, infertility, and an excess of androgens (hirsutism, acne). It is linked to polycystic ovaries, increased weight, insulin resistance, and mental health issues like anxiety and depression^[5,6]. Women with PCOS face reproductive challenges like infertility and complications during pregnancy, metabolic problems such as type 2 diabetes and heart disease, and psychological issues including anxiety,

depression, diminished quality of life, and eating disorders^[7,8].

Global evidence-based recommendations for PCOS highlight the importance of lifestyle changes to mitigate weight-related risk factors. Diet and physical activity are primary approaches for managing weight and enhancing reproductive, endocrine, and health results^[9,10]. Diet aids in controlling PCOS. Diets with low glycemic index (GI), calorie management, and well-balanced nutrition enhance insulin resistance, body weight, and ovulation. Minimize refined carbohydrates and fats; boost intake of fiber, whole grains, fruits, vegetables, and lean proteins. The Mediterranean diet is likewise advantageous^[11]. Physical activity is vital for those with PCOS. It boosts insulin sensitivity, decreases fat, aids in weight loss, and promotes heart health. Aerobic and strength training enhance hormones and metabolic functions. It aids in regulating menstrual cycles and ovulation even without losing weight^[12].

Worldwide research indicates that changes in diet greatly enhance metabolic and reproductive results in women suffering from PCOS. A study found that diets with calorie restrictions and low glycemic

indexes lower body weight, decrease insulin resistance, and reduce androgen levels, which improves ovulatory function and hormonal balance^[10]. Consistent physical activity in PCOS enhances insulin sensitivity, decreases central obesity, and improves cardiovascular wellness. Research indicates that both aerobic and resistance exercises enhance metabolism and menstrual regularity, even in the absence of weight reduction^[12]. Studies consistently show that integrated lifestyle changes yield the greatest advancements in managing PCOS. Research indicates decreases in BMI, waist size, and inflammatory indicators, alongside enhanced ovulation and reproductive results when compared to individual treatments^[13]. Mohamed et al. discovered that lifestyle changes notably enhanced reproductive results (menstrual regularity, ovulation, fertility) and mental health (lower anxiety and depression, better quality of life) in women with PCOS, backing lifestyle modifications as an effective primary management approach^[14].

A study in Bangladesh indicated that PCOS impacts a considerable number of women of reproductive age, with a prevalence close to

6.9%, and is closely linked to menstrual irregularities, hyperandrogenic characteristics, and metabolic issues like obesity and insulin resistance [15]. Khondker and Nabila (2022) found that women with PCOS exhibited worse lifestyle behaviors, such as low activity levels, poor diet, and increased obesity rates when compared to healthy women, leading to more pronounced PCOS symptoms [16]. In Bangladesh, research on PCOS primarily centers on its prevalence and clinical characteristics, with scant evidence regarding lifestyle modifications. Few studies evaluate the impacts of diet, physical activity, and behavioral modifications on reproductive, metabolic, and psychological results. This research seeks to assess the effects of lifestyle changes on these results for women with PCOS in Bangladesh.

METHODS & MATERIALS

Study Design and Setting

This was a prospective interventional study conducted over a period of one year (October 2024 to September 2025) in the Outpatient Department (OPD) of Obstetrics and Gynaecology, Bangabandhu Medical University (BMU), Bangladesh. The study was designed to evaluate the impact of lifestyle modification on clinical, metabolic, and hormonal outcomes among women with polycystic ovary syndrome (PCOS).

Study Population

The study population consisted of women of reproductive age diagnosed with PCOS attending the OPD of the study hospital during the study period. Diagnosis was made based on the Rotterdam criteria, requiring the presence of at least two of the following:

- 1. Oligo- or anovulation
- 2. Clinical and/or biochemical hyperandrogenism
- 3. Polycystic ovaries on ultrasonography

Adherence Assessment

Adherence to lifestyle modification was assessed using a composite score incorporating dietary adherence (24-hour recall), physical activity compliance (weekly exercise duration), and follow-up attendance. Each component was expressed as a percentage, and the overall adherence score was calculated as the mean of the three components. Participants were categorized as having good (≥75%), moderate (50–74%), or poor (<50%) adherence.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics version 25. Continuous variables were expressed as mean ± standard deviation (SD), and categorical

Sample Size and Sampling Technique

A total of 220 participants were recruited using a non-probability purposive sampling technique. All eligible and consenting patients attending the OPD during the study period were consecutively enrolled until the desired sample size was achieved.

Eligibility Criteria

Women aged 18–35 years diagnosed with PCOS based on Rotterdam criteria and willing to provide written informed consent were included in the study. Women who were pregnant or lactating, those who had used hormonal therapy or insulin-sensitizing agents within the last 3 months, and those with other endocrine disorders such as thyroid dysfunction, hyperprolactinemia, or Cushing’s syndrome were excluded. Patients with chronic systemic illnesses or long-term medication use affecting metabolism were also excluded.

Intervention Protocol

All participants received a structured lifestyle modification program consisting of dietary modification, physical activity, and behavioral counseling.

Dietary Modification

Participants were counseled on a calorie-restricted balanced diet based on individual energy requirements. Key recommendations included:

- Reduction of refined carbohydrates and saturated fats
- Increased intake of fiber-rich foods, vegetables, and fruits
- Adequate protein intake and portion control

Physical Activity

Participants were advised to perform:

- At least 150 minutes per week of moderate-intensity aerobic exercise (e.g., brisk walking, cycling)

- Muscle-strengthening exercises at least twice per week

Counseling and Follow-up Support

Regular counseling was provided to reinforce adherence to dietary and exercise recommendations throughout the follow-up period.

Data Collection Procedure

Baseline data were collected at enrollment using a structured questionnaire and clinical examination. Information on sociodemographic characteristics (age, occupation, education), menstrual history, and clinical features such as acne and hirsutism were recorded. Anthropometric measurements including weight, height, body mass index (BMI), and waist circumference were measured using standardized techniques. Biochemical parameters, including fasting blood glucose and fasting insulin, as well as hormonal profile markers such as serum testosterone, luteinizing hormone (LH), and follicle-stimulating hormone (FSH), were assessed at baseline.

Follow-up Assessment

Each participant was followed for 3 months after initiation of lifestyle intervention. At the end of the follow-up period, the same clinical, anthropometric, biochemical, and hormonal assessments performed at baseline were repeated using identical standardized methods. Primary outcomes included changes in body weight, BMI, and menstrual regularity, while secondary outcomes included changes in insulin resistance, hormonal profile, and clinical features of hyperandrogenism such as acne and hirsutism.

Assessment of Outcomes

Menstrual regularity was defined as cycle length between 21–35 days. Clinical hyperandrogenism was assessed using clinical examination for acne and the modified Ferriman–Gallwey (mFG) scoring system for hirsutism.

Insulin resistance was calculated using the HOMA-IR formula:

HOMA-IR =
$$\frac{\text{Fasting insulin } (\mu\text{IU/mL}) \times \text{Fasting glucose (mmol/L)}}{22.5}$$

variables as frequencies and percentages. Paired t-test was used to compare pre- and post-intervention outcomes, while Chi-square test was applied for categorical variables. A p-value <0.05 was considered statistically significant.

ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Review Board (IRB) of Bangladesh Medical University (BMU). Written informed consent was obtained from all participants prior to enrollment. Confidentiality and anonymity of participant data were strictly maintained throughout the study.

RESULTS

Baseline Characteristics of the Study Participants

Table I shows total of 220 women diagnosed with PCOS were enrolled in the study. The mean age of the participants was 24.8 ± 4.6 years, with the highest proportion belonging to the 21–25 years age group (42.7%). Regarding nutritional status, the majority of participants were either overweight or obese (68.2%), while 31.8% had normal BMI. Menstrual irregularity was reported by 72.7% of the participants, and 61.4% exhibited clinical features of hyperandrogenism.

Table I
Baseline Characteristics of Study Participants (n = 220).

Variable	Frequency (n)	Percentage (%)
Age group (years)		
≤20	38	17.3
21–25	94	42.7
26–30	56	25.5
>30	32	14.5
BMI category		
Normal (18.5–24.9)	70	31.8
Overweight (25–29.9)	96	43.6
Obese (≥30)	54	24.6
Menstrual pattern		
Regular	60	27.3
Irregular	160	72.7
Clinical hyperandrogenism		
Present	135	61.4
Absent	85	38.6

Adherence to Lifestyle Intervention
Figure I present, out of the 220 enrolled participants, 198 (90.0%) completed the 6-month follow-up and were included in the

final analysis. Based on the composite adherence scoring system, 68.7% of participants demonstrated good adherence (≥75%), while 19.2% and 12.1% showed moderate and poor adherence, respectively.

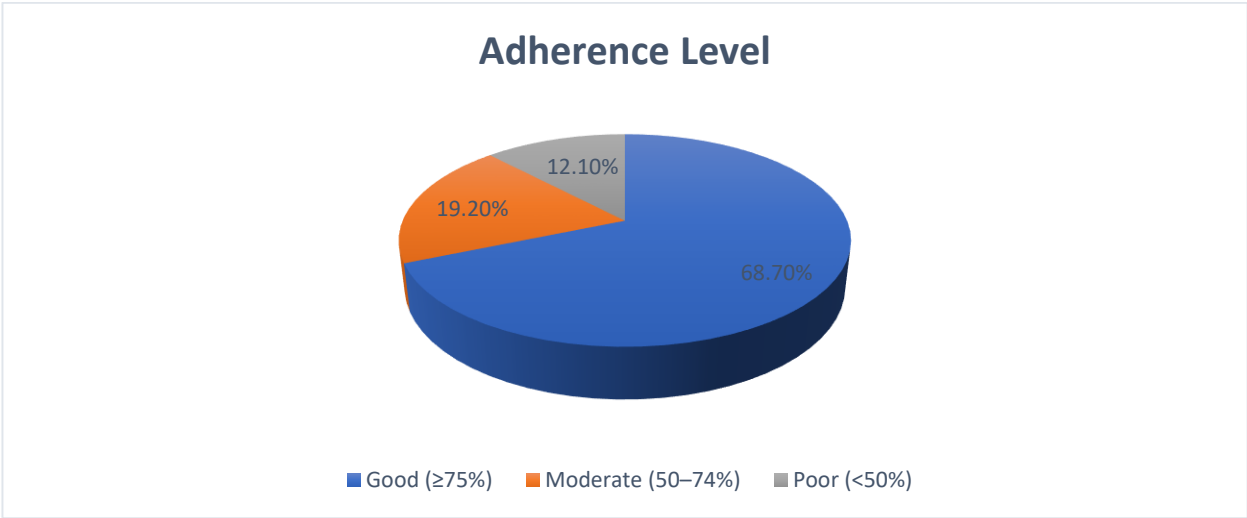


Figure 1 Adherence to Lifestyle Intervention (n = 198)

Changes in Anthropometric Parameters
Table II shows, following 6 months of lifestyle intervention, notable improvements were observed in anthropometric measures. The mean body

weight decreased from 72.4 ± 10.2 kg at baseline to 67.8 ± 9.5 kg, while mean BMI reduced from 28.6 ± 3.9 kg/m² to 26.8 ± 3.5 kg/m². Similarly, waist circumference declined from 92.1 ± 8.4 cm to 86.3 ± 7.6 cm. Overall, 59.1% of participants achieved a clinically significant weight reduction of at least 5%.

Table II
Changes in Anthropometric Parameters (n = 198).

Parameter	Baseline (Mean ± SD)	6 months (Mean ± SD)	Mean Change
Weight (kg)	72.4 ± 10.2	67.8 ± 9.5	–4.6
BMI (kg/m²)	28.6 ± 3.9	26.8 ± 3.5	–1.8
Waist circumference (cm)	92.1 ± 8.4	86.3 ± 7.6	–5.8

Menstrual Pattern Outcomes
Table III shows, baseline, 160 participants (72.7%) reported irregular menstrual cycles. After the intervention, 108 (67.5%) of these

participants achieved regularization of their cycles, while 32.5% continued to experience irregularity. In addition, the mean menstrual cycle length improved markedly from 45.2 ± 12.6 days to 32.8 ± 6.4 days.

Table III
Menstrual Pattern Improvement (*n* = 160).

Outcome	Frequency (n)	Percentage (%)
Regularized cycle	108	67.5
Still irregular	52	32.5
Mean cycle length improved from 45.2 ± 12.6 days to 32.8 ± 6.4 days		

Biochemical and Hormonal Changes
Table IV presents, significant improvements were also observed in metabolic and hormonal parameters following lifestyle modification. Mean fasting blood glucose decreased from 5.6 ± 0.8 mmol/L to 5.1 ± 0.6 mmol/L, and fasting insulin levels reduced from 18.9 ± 6.5 µIU/mL to 13.7 ± 5.2 µIU/mL, leading to a reduction in HOMA-IR from 4.2 ± 1.7 to 2.9 ± 1.3. In terms of hormonal profile, mean serum testosterone decreased from 2.1 ± 0.7 nmol/L to 1.5 ± 0.5 nmol/L, and the LH/FSH ratio improved from 2.3 ± 0.9 to 1.6 ± 0.6.

Table IV
Changes in Biochemical and Hormonal Parameters (*n* = 198).

Parameter	Baseline (Mean ± SD)	6 months (Mean ± SD)	Mean Change
Fasting glucose (mmol/L)	5.6 ± 0.8	5.1 ± 0.6	-0.5
Fasting insulin (µIU/mL)	18.9 ± 6.5	13.7 ± 5.2	-5.2
HOMA-IR	4.2 ± 1.7	2.9 ± 1.3	-1.3
Serum testosterone (nmol/L)	2.1 ± 0.7	1.5 ± 0.5	-0.6
LH/FSH ratio	2.3 ± 0.9	1.6 ± 0.6	-0.7

Clinical Hyperandrogenism Outcomes
Table V shows among the participants with clinical hyperandrogenism at baseline (*n* = 135), improvement in acne was observed in 54.1%, while 48.1% showed a reduction in hirsutism scores.

Table V
Clinical Hyperandrogenism Outcomes after Lifestyle Intervention (*n* = 135).

Outcome Variable	Improved n (%)	Not Improved n (%)	Total (n)
Acne	73 (54.1)	62 (45.9)	135
Hirsutism (mFG score)	65 (48.1)	70 (51.9)	135

Comparison of Outcomes by Adherence Level
Table VI shows, comparison of outcomes based on adherence level revealed that participants with good adherence experienced substantially greater benefits. The mean weight reduction in the good adherence group was -6.2 kg, compared to -2.1 kg among those with moderate or poor adherence. Similarly, 74.3% of participants in the good adherence group achieved menstrual regularization, compared to 51.6% in the lower adherence group. Improvements in insulin resistance were also more pronounced among those with good adherence, as reflected by a greater reduction in HOMA-IR.

Table VI
Outcomes by Adherence Level (*n* = 198).

Outcome	Good Adherence (n=136)	Moderate/Poor (n=62)
Mean weight loss (kg)	-6.2	-2.1
≥5% weight loss (%)	72.8	29.0
Menstrual regularization (%)	74.3	51.6
Reduction in HOMA-IR	-1.8	-0.6

Overall, lifestyle intervention led to significant improvements in anthropometric indices, menstrual regularity, metabolic parameters, and clinical features of hyperandrogenism among women with PCOS. Importantly, the magnitude of these improvements was consistently higher among participants with better adherence, underscoring the critical role of compliance in achieving optimal clinical outcomes.

DISCUSSION

This study indicates that Polycystic Ovary Syndrome is prevalent among young females, especially those between 21 and 25 years old. A significant prevalence of overweight and obesity was found, in agreement with results from Mahsa Amiri et

al. (2024), who indicated a strong link between obesity and PCOS as well as its severity [17]. Menstrual irregularities and hyperandrogenism were also prevalent, aligning with the results reported by Elena Garzia et al. (2022), who recognized these characteristics as significant clinical indicators in PCOS, especially concerning treatment outcomes [18]. A completion rate of 90.0% for follow-ups and an adherence rate of 68.7% were recorded. This is consistent with the research by Megan Parker et al. (2020), which indicated that compliance with lifestyle changes in Polycystic Ovary Syndrome can be enhanced through consistent support, although sustaining these changes over time is difficult [19].

Notable decreases in weight, BMI, and waist circumference were recorded after 6 months, with 59.1% reaching ≥5% weight loss. This aligns with research by Lim et al., 2019 which demonstrated that lifestyle changes result in significant anthropometric enhancements in Polycystic Ovary Syndrome, even with slight weight reduction [20]. Menstrual results showed considerable improvement post-intervention, with 67.5% attaining cycle regularity and a notable decrease in cycle duration. These findings align with Teede et al. (2018), who indicated that lifestyle changes enhance menstrual regularity in PCOS primarily through improvements in weight-related metabolic and hormonal factors [9].

Notable enhancements in insulin resistance and hormonal profile were noted following intervention in PCOS. These results correspond with Shah et al. (2017), who noted a strong connection between metabolic irregularities and hormonal imbalance in PCOS, suggesting that enhancements in anthropometric and biochemical measures are associated with improved hormonal conditions ^[21].

Women with Polycystic Ovary Syndrome showed improvement in clinical hyperandrogenism, experiencing less acne and hirsutism following the intervention. This aligns with Ezech et al., who found that hyperandrogenic symptoms like hirsutism show improvement with proper management in PCOS ^[22].

In women with Polycystic Ovary Syndrome, greater compliance with lifestyle changes correlated with enhanced progress in weight, menstrual regularity, and insulin resistance. This is consistent with Mendoza et al., who found that higher compliance with intervention in PCOS is associated with better clinical results and enhanced quality of life ^[23].

The study suggests that lifestyle intervention leads to significant improvements in metabolic, hormonal, menstrual, and clinical outcomes for young overweight women with PCOS, with better results observed in those with higher adherence, aligning with prior evidence.

CONCLUSION

The results highlight that lifestyle changes must be the cornerstone of PCOS treatment. Considering the notable enhancements seen in just 6 months, healthcare professionals ought to focus on encouraging sustainable, high-adherence lifestyle practices. This method could not only relieve short-term symptoms but also lower the long-term metabolic dangers linked to PCOS, possibly decreasing the necessity for significant medication intervention.

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