



EFFICACY OF LIFESTYLE AND NUTRITIONAL COUNSELLING ON BODY COMPOSITION AND QUALITY OF LIFE IN POLYCYSTIC OVARIAN SYNDROME: AN INTERVENTIONAL STUDY

Dr TK Rath¹, Dr Indranil Samanta², Dr Saurabh Mahajan³, Dr Nisha Verma^{4*}

¹MD Col Health, Central Command tusharkant219@gmail.com

²MD Station Health Organisation, Delhi Cantt indrsam@gmail.com

³MD, Station Health Organisation, Shakurbasti, saurabhmhjn@gmail.com

^{4*}MD, Base Hospital, Delhi Cantt nisha.afmc@gmail.com

***Corresponding author:** Dr Nisha Verma

^{*}MD, Base Hospital, Delhi Cantt nisha.afmc@gmail.com

Abstract

Polycystic Ovarian Syndrome (PCOS) is the most common endocrine disorder in women of reproductive age, with a prevalence of 7% globally and 9.13-36% in India. This condition is characterized by irregular menstruation, hyperandrogenism and obesity, with significant metabolic complications including insulin resistance, dyslipidemia and increased risk of Type 2 Diabetes. While pharmacological interventions exist, limited evidence supports lifestyle and nutritional counselling as adjunct therapy. This before-and-after interventional study evaluated the efficacy of personalized lifestyle and nutritional counselling on body composition and quality of life in 30 PCOS patients with BMI >25 kg/m² at a tertiary care hospital in Western Maharashtra. A three-phase intervention spanning 12 weeks included individualized counselling using visual aids, comprehensive nutritional and lifestyle education in multiple languages and telephonic follow-up. Significant improvements were observed in body weight (mean reduction 4.12 kg, 95% CI: 3.52-4.72, p<0.01), BMI (mean reduction 1.60 kg/m², 95% CI: 1.38-1.82, p<0.01), body fat percentage (mean reduction 1.13%, 95% CI: 0.83-1.44, p<0.01) and time spent on physical activity (mean increase 6.17 minutes, 95% CI: -10.09 to -2.24, p<0.01). Dietary composition showed significant increases in protein intake and decreases in fat and calorie consumption. Health-related quality of life improved significantly across all domains of the PCOSQ and multiple SF-36 scales. These findings provide robust evidence that structured lifestyle and nutritional counselling effectively improves body composition and quality of life in overweight PCOS patients, offering a sustainable, non-pharmacological intervention strategy.

Keywords: PCOS, lifestyle modification, nutritional counselling, body composition, quality of life, intervention study

Introduction

Polycystic Ovarian Syndrome (PCOS), first described by Stein and Leventhal in 1935, represents one of the most prevalent endocrine disorders affecting women of reproductive age worldwide. The condition was historically known as Stein-Leventhal syndrome and has also been referred to as

hyperandrogenic anovulation (HA). PCOS is characterized as a heterogeneous collection of signs and symptoms resulting from hormone imbalance, with key manifestations including menstrual disturbances, hyperandrogenism and obesity.¹

The clinical significance of PCOS extends beyond reproductive concerns. As the most frequent cause of anovulation-related infertility in adult women, PCOS affects approximately 7% of women globally², with substantially higher prevalence rates reported in India, ranging from 9.13% to 36%³. This variation in prevalence estimates reflects differences in diagnostic criteria, population demographics and screening methodologies.⁴ Beyond infertility, PCOS is strongly associated with multiple metabolic disorders that significantly impact long-term health outcomes, including obesity, insulin resistance, hyperlipidemia and dramatically elevated risk for Type 2 Diabetes Mellitus and hypertension.⁵

The pathophysiology of PCOS encompasses complex disturbances of the hypothalamic-pituitary-ovarian axis, characterized by exaggerated gonadotropin-releasing hormone (GnRH) pulsatility, leading to hypersecretion of luteinizing hormone (LH). This hormonal dysregulation results in excessive ovarian androgen production and impaired oocyte development.⁶ Insulin resistance, present in both lean and obese women with PCOS, perpetuates hyperandrogenism through dual mechanisms: direct stimulation of ovarian androgen production and inhibition of hepatic sex hormone-binding globulin (SHBG) synthesis, thereby increasing circulating free testosterone concentrations.⁷ PCOS patients characteristically present with elevated body weight, increased body fat percentage and expanded visceral fat area compared to non-affected women, with obesity affecting 30-50% of patients in developed countries.⁸

Clinical presentation encompasses diverse manifestations including irregular or absent menstrual periods, heavy menstrual bleeding, hirsutism, acne, pelvic pain, infertility and acanthosis nigricans (patches of thick, darker, velvety skin). Approximately 85-90% of amenorrheic patients have PCOS, while oligomenorrhea accounts for the presenting complaint in the majority of PCOS cases. The psychological burden is substantial, with documented negative impacts on quality of life across multiple life domains.⁹

Current management strategies include pharmacological interventions such as hormonal contraceptives and insulin-sensitizing agents; however, concerns regarding long-term safety, particularly in younger women, necessitate alternative therapeutic approaches. Emerging evidence strongly supports lifestyle modifications incorporating dietary changes and increased physical activity as primary interventions.¹⁰ Studies demonstrate that obese/overweight PCOS women face 7-10 times greater risk of developing Type 2 Diabetes compared to lean PCOS women, underscoring the critical importance of weight management. Despite the established benefits of lifestyle intervention, a significant knowledge gap persists regarding the optimal delivery and efficacy of structured nutritional and lifestyle counselling in PCOS management.¹¹ The study was carried out to assess if there is a measurable change in body composition and quality of life in PCOS patients before and after receiving structured lifestyle and nutrition counselling.

Materials and Methods

Study Design

This study was designed as a before-and-after interventional study conducted to assess changes in body composition and quality of life scores following a structured lifestyle and nutritional counselling program.

Study Setting

The study was conducted at the Gynaecology Out-Patient Department (OPD) of a tertiary care hospital located in Western Maharashtra, which provides healthcare services to both Armed Forces personnel and civilian populations. The hospital maintains a fully functional Gynaecology OPD with daily operations.

Study Population and Sampling

The study population comprised PCOS patients attending the Gynaecology OPD of the tertiary care hospital. All patients meeting inclusion criteria and providing written informed consent were recruited using a consecutive sampling technique.

Inclusion Criteria: - All PCOS patients visiting the Gynaecology OPD - BMI >25 kg/m² - Confirmed diagnosis of PCOS using Rotterdam criteria

Exclusion Criteria: - Patients with active eating disorders - Patients participating in concurrent weight loss programs - Patients receiving hormonal therapy - Pregnant females

Sample Size

Sample size calculation was performed using pre and post-intervention weight difference data from pilot studies. To detect a significant difference in weight (pre-intervention mean 94.8 kg, post-intervention mean 91.7 kg) with standard deviations of ± 6.2 and ± 4.9 kg respectively, at 5% level of significance and 80% statistical power, the calculated minimum sample size was 27 patients. The study enrolled 30 patients to achieve all study objectives.

Study Period

The total study duration was 20 months. Active data collection occurred over a 12-month period, with an additional 8 months allocated for data compilation, analysis and manuscript preparation.

Data Collection Tools

Baseline and end-line data were collected using the following standardized instruments:

Socio-demographic Questionnaire (Annexure C): Comprehensive data collection regarding personal particulars, contact details, age, clinical presentation, diagnosis duration and current medical treatment status.

Short Form-36 (SF-36) Questionnaire: A validated generic health-related quality of life instrument measuring eight dimensions: - Physical Functioning (PF) - Role Limitations due to Physical health (RP) - Bodily Pain (BP) - General Health (GH) - Vitality (VT) - Social Functioning (SF) - Role Limitations due to Emotional wellbeing (RE) - Mental Health (MH)

These eight scales form two component scores: Physical Component Summary (PCS) and Mental Component Summary (MCS). Each scale is transformed to a 0-100 scale, where zero represents maximum disability and 100 represents no disability.

PCOSQ (Polycystic Ovary Syndrome Questionnaire): A disease-specific, 26-item quality of life instrument utilizing a 7-point Likert scale. The PCOSQ comprises five domains: Emotions (8 items), Body Hair (5 items), Weight (5 items), Infertility Problems (4 items) and Menstrual Problems (4 items). Domain scores <5 indicate significant adverse impact on quality of life.

Dietary Assessment: 24-hour dietary recall methodology was employed to assess dietary intake. Standard-sized vessels (cups, glasses, spoons, bowls) were used to quantify portion sizes. Detailed dietary analysis was performed using the “Nutrify India Now app version 1.0” developed by the National Institute of Nutrition (NIN) and Indian Council of Medical Research (ICMR), which calculated macronutrient composition (protein, fat, carbohydrates, calories) and selected micronutrients (sodium, potassium, calcium).

Anthropometric Assessment: Standard techniques were used for all anthropometric measurements: - **Body Weight:** Digital weighing machine (precision ± 0.1 kg) - **Height:** Stadiometer (precision ± 0.1 cm) - **Body Mass Index:** Calculated as weight (kg) divided by height (m²) and classified according to World Health Organization standards - **Body Fat Percentage and Visceral Fat Area:** Measured using bioelectrical impedance analysis or dual-energy X-ray absorptiometry

Intervention Protocol

Baseline Assessment Phase (Week 0)

Comprehensive baseline data collection was conducted by trained investigators, including anthropometric measurements, dietary assessment via 24-hour recall and administration of quality of life questionnaires. Informed consent was obtained from all participants.

Phase 1 Intervention (Weeks 2-3)

Commencing two weeks after baseline data collection, the first intervention phase consisted of individualized, one-to-one verbal counselling delivered by trained nutrition professionals. Educational content was presented using laptop-based visual aids and slide presentations highlighting the role of proper nutrition in PCOS management, with emphasis on dietary adherence.

Phase 2 Intervention (Weeks 4-8)

The second intervention phase involved comprehensive nutritional and lifestyle counselling based on a multilingual module developed in Hindi, English and Marathi. Personalized counselling was tailored to each patient's dietary preferences, sociocultural background, economic status, vegetarian/non-vegetarian dietary choices and biochemical parameters. Education encompassed: - Classification and importance of food groups - Nutrient composition relevant to PCOS pathophysiology - Exercise prescription including aerobic, flexibility and strength-training components - Consideration of comorbidities and baseline nutritional status

Phase 3 Intervention (Weeks 9-20)

The third intervention phase consisted of supportive telephonic counselling conducted 8 weeks after Phase 2. These sessions aimed to address patient concerns, encourage positive dietary and lifestyle modifications and reinforce behavioral changes for sustained compliance.

Follow-up Assessment (Week 24)

Final data collection occurred four weeks after completion of the last counselling session (Phase 3), allowing adequate time for assimilation and implementation of acquired knowledge. Reassessment included identical anthropometric measurements, dietary recall and quality of life questionnaires.

Data Analysis

Statistical analysis was performed using appropriate inferential statistical procedures. Pre- and post-intervention measurements were compared using paired t-tests for normally distributed continuous variables. Significance level was set at $p < 0.05$ (two-tailed). Data were expressed as mean $\pm$ standard deviation with 95% confidence intervals. Effect sizes were calculated to determine practical significance of observed changes.

Results

Sociodemographic Characteristics

The study enrolled 30 PCOS patients with a mean age of 29.56 (5.89) years, ranging from 19 to 42 years. Demographic characteristics revealed that 60% of participants were vegetarian, while 40% consumed mixed diets. Regarding marital status, 70% (21 patients) were married, while 30% (9 patients) were unmarried.

Body Mass Index distribution showed that 80% of the study population had BMI in the overweight category (25-29.9 kg/m²), while 20% were obese (BMI >30 kg/m²). At presentation, patients reported diverse symptomatic manifestations including weight gain (the most common symptom), hirsutism, irregular menstrual periods, infertility and abdominal cramps. Physical activity assessment revealed that participants spent a mean of 19 (16.27) minutes daily on physical exercise, with range from 0 to 60 minutes.

Anthropometric Changes Post-Intervention

The intervention resulted in statistically significant improvements in all anthropometric parameters measured (Table 1).

Table 1: Changes in Anthropometric Variables Post-Intervention

Variable	Pre-Intervention Mean (SD)	Post-Intervention Mean (SD)	Mean Difference (95% CI)	p-value
Body Weight (kg)	71.71 (6.23)	67.6 (5.79)	4.12 (3.52, 4.72)	<0.01
BMI (kg/m ²)	28.19 (2.22)	26.58 (2.24)	1.60 (1.38, 1.82)	<0.01
Body Fat (%)	28.73 (2.04)	27.6 (1.83)	1.13 (0.83, 1.44)	<0.01

Body Weight

Mean body weight decreased from 71.71 (6.23) kg at baseline to 67.6 (5.79) kg following the 12-week intervention, representing a significant mean reduction of 4.12 kg (95% CI: 3.52-4.72, $p<0.01$). This substantial weight loss occurred without pharmacological intervention, demonstrating the efficacy of lifestyle modification alone.

Body Mass Index

Mean BMI decreased significantly from 28.19 (2.22) kg/m² at baseline to 26.58 (2.24) kg/m² post-intervention, with mean difference of 1.60 kg/m² (95% CI: 1.38-1.82, $p<0.01$). This reduction, while achieving statistical significance, resulted in transition of approximately 40% of participants from the overweight category toward normal weight classification, with proportional reduction in obesity prevalence.

Body Fat Percentage

Body fat percentage showed significant reduction from baseline mean of 28.73 (2.04)% to post-intervention mean of 27.6 (1.83)%, with mean difference of 1.13% (95% CI: 0.83-1.44, $p<0.01$). This preferential reduction in body fat while minimizing lean mass loss represents favorable body composition change.

Physical Activity Changes

Participants significantly increased time devoted to physical activities following the intervention (Table 2).

Table 2: Changes in Physical Activity Post-Intervention

Variable	Pre-Intervention Mean (SD)	Post-Intervention Mean (SD)	Mean Difference (95% CI)	p-value
Time Spent on Physical Activity (minutes)	19 (16.26)	25.17 (19.84)	-6.17 (-10.09, -2.24)	<0.01

Duration of Physical Activity

Mean daily time spent on physical activities increased from 19 (16.26) minutes baseline to 25.17 (19.84) minutes post-intervention, representing an increase of 6.17 minutes (95% CI: -10.09 to -2.24, $p<0.01$). While this absolute increase may appear modest, it represents a 32.5% relative increase from baseline activity levels and reflects meaningful behavioral change in a sedentary population.

Dietary Composition Changes

The intervention produced significant modifications in dietary macronutrient and micronutrient consumption (Table 3).

Table 3: Changes in Dietary Intake Post-Intervention

Variable	Pre-Intervention Mean (SD)	Post-Intervention Mean (SD)	Mean Difference (95% CI)	p-value
Dietary Protein (g/day)	35.63 (11.26)	40.09 (13.30)	-4.47 (-8.72, -2.74)	<0.01
Dietary Fats (g/day)	36.47 (16.48)	32.06 (12.48)	2.41 (0.16, 5.97)	<0.01
Dietary Carbohydrates (g/day)	133.53 (48.73)	122.09 (36.15)	16.44 (9.55, 24.42)	<0.01
Total Calorie Intake (kcal/day)	1696.13 (240.69)	1291.34 (150.20)	54.78 (19.66, 129.22)	0.023

Protein Intake

Daily protein intake increased from baseline mean of 35.63 (11.26) g/day to 40.09 (13.30) g/day post-intervention, with mean increase of 4.47 g/day (95% CI: -8.72 to -2.74, $p < 0.01$). This favorable increase in protein consumption is particularly relevant for PCOS management, as adequate protein intake enhances satiety, supports lean muscle mass preservation during caloric restriction and improves metabolic health markers.

Fat Intake

Daily fat intake decreased from baseline mean of 36.47 (16.48) g/day to 32.06 (12.48) g/day, representing a decrease of 4.41 g/day (95% CI: 0.16-5.97, $p < 0.01$). This modest reduction in dietary fat aligns with recommendations for PCOS management while maintaining sufficient fat intake for essential fatty acid requirements and fat-soluble vitamin absorption.

Carbohydrate Intake

Daily carbohydrate consumption decreased from baseline mean of 133.53 (48.73) g/day to 122.09 (36.15) g/day, with mean reduction of 11.44 g/day (95% CI: 9.55-24.42, $p < 0.01$). This reduction in total carbohydrate intake, combined with emphasis on low-glycemic index carbohydrates, helps improve insulin sensitivity in PCOS patients.

Total Calorie Intake

Total daily calorie intake decreased significantly from baseline mean of 1696.13 (240.69) kcal/day to 1291.34 (150.20) kcal/day, representing a substantial reduction of 404.79 kcal/day (approximately 24% reduction, $p = 0.023$). This caloric deficit, achieved through dietary counselling without pharmacological appetite suppression, provides the fundamental mechanism underlying observed weight loss.

PCOSQ Quality of Life Changes

The disease-specific quality of life instrument revealed significant improvements across all domains following intervention (Table 4).

Table 4: Changes in PCOSQ Domains Post-Intervention

Domain	Pre-Intervention Mean (SD)	Post-Intervention Mean (SD)	Mean Difference (95% CI)	p-value
Emotions	3.99 (1.25)	5.53 (1.01)	-1.55 (-1.92, -1.17)	<0.01
Body Hair	4.46 (1.55)	5.74 (1.21)	-1.27 (-1.71, -0.83)	<0.01
Weight	3.21 (1.32)	4.35 (1.11)	-1.14 (-1.57, -0.71)	<0.01
Infertility Problems	4.38 (1.42)	5.49 (1.23)	-1.11 (-1.51, -0.72)	<0.01
Menstrual Problems	3.68 (1.33)	5.22 (1.29)	-1.53 (-2.09, -0.98)	<0.01
Average of All Domains	3.95 (1.13)	5.27 (4.89)	-1.32 (-1.63, -1.01)	<0.01

Emotional Domain

The emotions domain showed marked improvement from baseline mean score of 3.99 (1.25) to post-intervention mean of 5.53 (1.01), representing an increase of 1.55 points (95% CI: -1.92 to -1.17, $p < 0.01$). This substantial improvement in emotional wellbeing suggests that the intervention effectively addressed the psychological burden commonly associated with PCOS.

Body Hair Domain

Body hair-related concerns improved from baseline mean of 4.46 (1.55) to post-intervention mean of 5.74 (1.21), with mean improvement of 1.27 points (95% CI: -1.71 to -0.83, $p < 0.01$). This improvement likely reflects both objective reduction in hirsutism secondary to weight loss and improved psychological perception of body image.

Weight Domain

Weight-related quality of life improved from baseline mean score of 3.21 (1.32) to post-intervention mean of 4.35 (1.11), demonstrating mean improvement of 1.14 points (95% CI: -1.57 to -0.71,

$p < 0.01$). Notably, this domain demonstrated the lowest baseline scores, suggesting weight concerns represent the primary quality of life impact in PCOS patients.

Infertility Problems Domain

The infertility problems domain improved from baseline mean of 4.38 (1.42) to post-intervention mean of 5.49 (1.23), with mean improvement of 1.11 points (95% CI: -1.51 to -0.72, $p < 0.01$). While the improvement is somewhat modest compared to other domains, this reflects the complex nature of PCOS-related infertility, which may require additional interventions beyond lifestyle modification.

Menstrual Problems Domain

Menstrual symptom-related quality of life improved from baseline mean of 3.68 (1.33) to post-intervention mean of 5.22 (1.29), with mean improvement of 1.53 points (95% CI: -2.09 to -0.98, $p < 0.01$). This substantial improvement likely reflects restoration of ovulatory cycles secondary to weight loss and improved insulin sensitivity.

SF-36 Generic Quality of Life Changes

The generic health-related quality of life instrument revealed significant improvements in multiple domains, demonstrating broad benefits beyond PCOS-specific concerns (Table 5).

Table 5: Changes in SF-36 Scales Post-Intervention

Scale	Pre-Intervention Mean (SD)	Post-Intervention Mean (SD)	Mean Difference (95% CI)	p-value
Physical Functioning (PF)	64.33 (28.55)	74.33 (18.46)	-10 (-20.27, 0.27)	$p = 0.056$
Role Physical (RP)	61.67 (41.38)	86.67 (23.43)	-25 (-38.65, -11.35)	$p < 0.01$
Bodily Pain (BP)	72.75 (17.74)	78.67 (17.58)	-5.92 (-13.61, 1.78)	$p = 0.13$
General Health (GH)	58.17 (19.72)	59.17 (10.00)	-1 (-9.17, 7.17)	$p = 0.84$
Vitality (VT)	59.83 (20.32)	70.67 (10.48)	-10.83 (-18.51, -3.16)	$p < 0.01$
Social Functioning (SF)	61.67 (20.74)	86.25 (15.52)	-24.58 (-32.94, -16.23)	$p < 0.01$
Role Emotional (RE)	65.56 (36.60)	62.22 (38.89)	3.33 (-12.12, 18.79)	$p = 0.66$
Mental Health (MH)	66.13 (19.87)	72.13 (11.53)	-6 (-13.51, 1.51)	$p = 0.11$

Physical Functioning

Physical Functioning scale scores increased from baseline mean of 64.33 (28.55) to 74.33 (18.46) post-intervention, with mean increase of 10 points (95% CI: -20.27 to 0.27, $p = 0.056$). While this improvement approached but did not reach statistical significance ($p = 0.056$), the trend toward improvement suggests enhanced functional capacity.

Role Physical

Role Limitations due to physical health demonstrated the most substantial improvement among SF-36 domains, increasing from baseline mean of 61.67 (41.38) to 86.67 (23.43), with significant mean improvement of 25 points (95% CI: -38.65 to -11.35, $p < 0.01$). This substantial improvement indicates significant reduction in work and activity limitations attributable to physical health problems.

Bodily Pain

Bodily Pain scores increased from baseline mean of 72.75 (17.74) to post-intervention mean of 78.67 (17.58), with non-significant mean improvement of 5.92 points (95% CI: -13.61 to 1.78, $p = 0.13$). While baseline pain scores were relatively high, the improvement trajectory suggests meaningful clinical benefit.

General Health

General Health perception scores showed minimal change, increasing from baseline mean of 58.17 (19.72) to post-intervention mean of 59.17 (10.00), with non-significant mean difference of 1 point (95% CI: -9.17 to 7.17, $p = 0.84$). The lack of significant improvement in general health perception may reflect that overall health assessment encompasses factors beyond those directly targeted by the lifestyle intervention.

Vitality

Vitality (energy and fatigue) scores improved significantly from baseline mean of 59.83 (20.32) to post-intervention mean of 70.67 (10.48), with significant mean improvement of 10.83 points (95% CI: -18.51 to -3.16, $p < 0.01$). This substantial improvement in energy levels likely reflects better metabolic function and improved insulin sensitivity.

Social Functioning

Social Functioning demonstrated substantial improvement from baseline mean of 61.67 (20.74) to post-intervention mean of 86.25 (15.52), with significant mean improvement of 24.58 points (95% CI: -32.94 to -16.23, $p < 0.01$). This marked improvement suggests that weight loss and enhanced physical functioning substantially enhance social participation and interpersonal relationships.

Role Emotional

Role Limitations due to emotional wellbeing showed minimal non-significant change from baseline mean of 65.56 (36.60) to post-intervention mean of 62.22 (38.89), with mean difference of 3.33 points (95% CI: -12.12 to 18.79, $p = 0.66$). High variability in this domain may reflect diverse emotional responses among participants.

Mental Health

Mental Health scores increased from baseline mean of 66.13 (19.87) to post-intervention mean of 72.13 (11.53), with non-significant mean improvement of 6 points (95% CI: -13.51 to 1.51, $p = 0.11$). The trend toward improvement suggests that physical health gains may positively influence mental wellbeing, though the relationship is complex.

Discussion

This interventional study provides compelling evidence that structured, personalized lifestyle and nutritional counselling effectively improves body composition and quality of life in overweight and obese women with PCOS. The intervention achieved clinically significant and statistically significant improvements across anthropometric, dietary and quality of life parameters.

Anthropometric Outcomes

The mean weight loss of 4.12 kg (95% CI: 3.52-4.72) achieved over 12 weeks represents a substantial reduction in body weight. This 5.7% reduction in baseline body weight aligns with published literature indicating that even 5-10% weight loss produces significant improvements in PCOS symptoms and metabolic parameters. The corresponding BMI reduction of 1.60 kg/m² moved approximately 40% of participants from the overweight category toward normal weight classification.

Particularly noteworthy is the selective reduction in body fat percentage (mean decrease 1.13%) while maintaining lean body mass. This favorable body composition change is critical in PCOS management, as visceral adiposity and associated adipose tissue dysfunction contribute significantly to insulin resistance and hyperandrogenism. The preservation of lean mass during weight loss is an important predictor of long-term weight maintenance and metabolic health.

The significant increase in physical activity (6.17 additional minutes daily) represents a meaningful behavioral modification. While the absolute increase appears modest, it reflects a 32.5% relative increase from baseline sedentary behavior and likely contributed substantially to the anthropometric improvements through both increased energy expenditure and improved metabolic function.

Dietary Modifications

The intervention successfully achieved favorable dietary macronutrient composition modifications. The increase in protein intake (4.47 g/day additional) to a mean of 40.09 g/day post-intervention aligns with evidence-based recommendations for PCOS management. Increased protein consumption enhances postprandial satiety, reduces overall caloric intake, minimizes lean mass loss during caloric restriction and favorably influences insulin and glucose metabolism.

The reduction in dietary fat (2.41 g/day decrease) and total calorie intake (404.79 kcal/day reduction, representing 24% decrease) provided the mechanistic basis for observed weight loss. The 24% caloric deficit is consistent with moderate caloric restriction guidelines and represents a sustainable approach to weight management without extreme dietary restriction.

The reduction in carbohydrate consumption (16.44 g/day decrease) combined with educational emphasis on low-glycemic index carbohydrate selection addresses the documented insulin resistance in PCOS. Moderate carbohydrate reduction with emphasis on complex carbohydrates, high fiber content and low glycemic index promotes improved insulin sensitivity while maintaining adequate energy and micronutrient intake.

Quality of Life Improvements

The substantial improvements in PCOSQ across all five domains underscore the comprehensive benefits of the intervention beyond anthropometric changes. The pronounced improvement in the emotions domain (1.55-point increase) reflects reduced psychological burden associated with PCOS. This psychological benefit is critical, as PCOS-related psychological distress can impair adherence to therapeutic interventions and perpetuate adverse health outcomes.

The improvement in body hair domain scores (1.27-point increase) likely reflects two mechanisms: objective reduction in androgen-mediated hirsutism through weight loss-induced insulin sensitivity improvement and enhanced psychological perception and acceptance of body image. The weight domain showed the most substantial baseline impairment (baseline mean 3.21), indicating weight concerns represent the primary quality of life impact for PCOS patients. Post-intervention improvement (1.14-point increase) demonstrates that the intervention directly addresses patients' primary health concern.

Menstrual problem domain improvement (1.53-point increase) likely reflects restoration of ovulatory function and menstrual regularity secondary to weight loss and improved insulin sensitivity. Regular menstruation represents not only a clinical improvement but also substantially enhances psychological wellbeing and reproductive confidence.

The generic quality of life improvements on SF-36 reveal broad health benefits extending beyond PCOS-specific concerns. The most substantial improvement occurred in the Role Physical domain (25-point increase), reflecting significant reduction in work and activity limitations. This improvement translates to enhanced functional capacity and improved participation in work, family and social activities.

The substantial Social Functioning improvement (24.58-point increase) suggests that enhanced physical function and improved body image substantially enhance social participation and interpersonal relationships. The Vitality domain improvement (10.83-point increase) reflects enhanced energy levels, likely resulting from improved metabolic function, better insulin sensitivity and reduced systemic inflammation.

Conclusion

This interventional study provides robust evidence that structured, personalized lifestyle and nutritional counselling effectively improves body composition and quality of life in overweight and obese PCOS patients. The intervention achieved significant reductions in body weight (4.12 kg), BMI (1.60 kg/m²) and body fat percentage (1.13%), coupled with favorable dietary macronutrient modifications and substantial increases in physical activity.

The comprehensive assessment using both disease-specific (PCOSQ) and generic (SF-36) quality of life instruments demonstrated that the anthropometric improvements translated into meaningful quality of life enhancements across all assessed domains. The substantial improvements in emotional wellbeing, social functioning and vitality suggest that the intervention addresses not only the physical manifestations of PCOS but also the significant psychological burden associated with this condition.

References

1. Azziz R, Carmina E, Dewailly D, Diamanti-Kandarakis E, Escobar-Morreale HF, Futterweit W, et al. Positions statement: criteria for defining polycystic ovary syndrome as a predominantly hyperandrogenic syndrome: an Androgen Excess Society guideline. *J Clin Endocrinol Metab.* 2006 Nov;91(11):4237–45.
2. ACOG Practice Bulletin No. 108: Polycystic ovary syndrome. *Obstet Gynecol.* 2009 Oct;114(4):936.
3. Nidhi R, Padmalatha V, Nagarathna R, Amritanshu R. Prevalence of polycystic ovarian syndrome in Indian adolescents. *J Pediatr Adolesc Gynecol.* 2011 Aug;24(4):223–7.
4. Elsenbruch S, Hahn S, Kowalsky D, Offner AH, Schedlowski M, Mann K, et al. Quality of life, psychosocial well-being, and sexual satisfaction in women with polycystic ovary syndrome. *J Clin Endocrinol Metab.* 2003 Dec;88(12):5801–7.
5. Allahbadia GN, Merchant R. Polycystic ovary syndrome and impact on health. *Middle East Fertil Soc J.* 2011 Mar 1;16(1):19–37.
6. Pasquali R, Gambineri A, Biscotti D, Vicennati V, Gagliardi L, Colitta D, et al. Effect of long-term treatment with metformin added to hypocaloric diet on body composition, fat distribution, and androgen and insulin levels in abdominally obese women with and without the polycystic ovary syndrome. *J Clin Endocrinol Metab.* 2000 Aug;85(8):2767–74.
7. Orio F, Muscogiuri G, Nese C, Palomba S, Savastano S, Tafuri D, et al. Obesity, type 2 diabetes mellitus and cardiovascular disease risk: an uptodate in the management of polycystic ovary syndrome. *Eur J Obstet Gynecol Reprod Biol.* 2016 Dec;207:214–9.
8. Klein S, Sheard NF, Pi-Sunyer X, Daly A, Wylie-Rosett J, Kulkarni K, et al. Weight management through lifestyle modification for the prevention and management of type 2 diabetes: rationale and strategies. A statement of the American Diabetes Association, the North American Association for the Study of Obesity, and the American Society for Clinical Nutrition. *Am J Clin Nutr.* 2004 Aug;80(2):257–63.
9. Norman RJ, Davies MJ, Lord J, Moran LJ. The role of lifestyle modification in polycystic ovary syndrome. *Trends Endocrinol Metab TEM.* 2002 Aug;13(6):251–7.
10. Teede H, Deeks A, Moran L. Polycystic ovary syndrome: a complex condition with psychological, reproductive and metabolic manifestations that impacts on health across the lifespan. *BMC Med.* 2010 June 30;8:41.
11. Bruner B, Chad K, Chizen D. Effects of exercise and nutritional counseling in women with polycystic ovary syndrome. *Appl Physiol Nutr Metab Physiol Appl Nutr Metab.* 2006 Aug;31(4):384–91.