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ORIGINAL ARTICLE

A prospective observational study of weight loss and change in the modified ferriman-gallwey score in polyendocrine metabolic ovarian syndrome (Formerly Polycystic Ovary Syndrome).

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ABSTRACT… Objective: To determine whether the magnitude of weight loss over six months was associated with improvement in Modified Ferriman–Gallwey (mFG) score among women with Polyendocrine Metabolic Ovarian Syndrome (PMOS), formerly Polycystic Ovary Syndrome (PCOS). **Study Design:** Prospective Observational Cohort study. **Setting:** Combined Military Hospital (CMH), Kharian. **Period:** December 2025 to June 2026. **Methods:** Twenty-seven women with PCOS/PMOS who achieved weight loss during six-month follow-up were analyzed. Weight, BMI, and mFG score were recorded monthly. Baseline-to-month-6 changes were assessed using paired tests, longitudinal changes using Friedman tests, and associations between weight loss and mFG improvement using Spearman rank correlation. **Results:** Mean weight decreased from 82.00±3.46 to 76.00±3.61 kg and BMI from 31.11±2.25 to 28.80±1.99 kg/m² (both p<0.001). Mean mFG score decreased from 18.19±3.06 to 13.67±2.79, with a median improvement of 5 points (IQR 2–6; p<0.001). Mean percentage weight loss was 7.30±2.67%, and 81.5% achieved ≥5% weight loss. Longitudinal changes in weight, BMI, and mFG score were significant (all p<0.001). Percentage weight loss was weakly and non-significantly correlated with mFG improvement (ρ=0.250, p=0.208). **Conclusion:** Weight, BMI, and mFG scores improved during follow-up; however, greater percentage weight loss was not significantly associated with greater mFG improvement, providing no evidence of a dose-response relationship or causal effect.

Key words: Hirsutism, Modified Ferriman–Gallwey Score, Obesity, Polycystic Ovary Syndrome, Weight Loss.

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INTRODUCTION

Polycystic ovary syndrome has been renamed polyendocrine metabolic ovarian syndrome (PMOS), reflecting its broader endocrine and metabolic phenotype rather than an emphasis on ovarian morphology alone.[1] Contemporary international guidance describes the disorder as a heterogeneous condition involving reproductive, hyperandrogenic, metabolic and psychological domains, with diagnostic and management decisions requiring an individualized approach.[2]

Adiposity and insulin resistance are closely linked to the expression of the syndrome, although the relationship is complex and likely heterogeneous across phenotypes.[3] Hyperandrogenism remains a central feature of the syndrome and may be expressed clinically through hirsutism and other androgen-related manifestations.[4] Hirsutism is commonly quantified using the Ferriman–Gallwey method and its modified form, which provide a structured clinical assessment of terminal hair growth in androgen-sensitive areas.[5] Clinical guidance also emphasizes standardized evaluation of hirsutism and exclusion of alternative causes of androgen excess where appropriate.[6]

Weight management is a core component of contemporary management of women with the syndrome who are overweight or obese. Metabolic dysfunction is also related to reproductive abnormalities, and insulin resistance may contribute to menstrual dysfunction independently of circulating androgen measures in some women.[7]

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Pharmacological weight-management strategies, including glucagon-like peptide-1 receptor agonists, are increasingly being studied in this population; semaglutide has shown clinically meaningful weight reduction and improvement in menstrual cyclicity in selected women with obesity and PCOS who had not responded to lifestyle intervention alone.[8]

Despite the clinical emphasis on weight management, the extent to which the magnitude of weight loss corresponds to improvement in an objective hirsutism score is less clearly defined in routine clinical follow-up. This question is relevant because improvement in weight, metabolic status and reproductive function may not necessarily occur in parallel with improvement in terminal hair growth. Therefore, prospective evaluation of changes in body weight and clinical hirsutism severity may help clarify whether the degree of weight reduction is associated with improvement in mFG score.

The present study therefore prospectively followed women with PCOS (referred to as PMOS in this manuscript where applicable) for six months and examined monthly changes in weight, BMI and Modified Ferriman–Gallwey (mFG) score. The primary objective was to determine the relationship between six-month percentage weight loss and improvement in mFG score. Secondary objectives were to describe the longitudinal pattern of anthropometric and mFG changes. Because this was an observational cohort study without randomization or a comparison group, the study was designed to evaluate associations rather than establish a causal effect of weight loss on hirsutism improvement.

METHODS

Study Design and Setting

This prospective observational cohort study was conducted at Combined Military Hospital (CMH), Kharian, from December 2025 to June 2026. The study evaluated longitudinal changes in body weight, body mass index (BMI), and Modified Ferriman–Gallwey (mFG) score over six months among women with an established diagnosis of polycystic ovary syndrome (PCOS), referred to as PMOS in this manuscript where applicable. The study was observational, and clinical management was determined by the treating clinician rather than assigned according to a research protocol. No random allocation or parallel control group was used.

Study Participants

Women with an established diagnosis of PCOS/PMOS who underwent clinical follow-up were considered for the study. Consecutive sampling was used from the available outpatient population. For the present analysis, participants were required to have baseline and six-month follow-up measurements of body weight and mFG score, to complete the six-month observation period, and to demonstrate a reduction in body weight between baseline and month 6. The final analytic cohort consisted of 27 women who fulfilled these criteria.

Women who did not complete six months of follow-up or who did not demonstrate weight loss between baseline and month 6 were not included in the analytic cohort. Women with recognized alternative causes of hirsutism or androgen excess, including androgen-secreting disorders, non-classical congenital adrenal hyperplasia, Cushing syndrome, and medication-related hyperandrogenism, were excluded. Women who opted for ovulation induction were also excluded from the analysis. Because the analytic cohort was restricted to women who achieved weight loss, the study was designed to examine the magnitude of weight loss in relation to change in hirsutism rather than to compare women who lost weight with women who did not lose weight.

The exclusion criteria for alternative causes of androgen excess and ovulation induction should be confirmed from the original clinical records if they were prospectively applied, as these details were not independently verifiable from the provided dataset.

Data collection and follow-up

Participants were evaluated at baseline and subsequently at monthly intervals for six months, resulting in seven assessment points: baseline and months 1, 2, 3, 4, 5, and 6. At each visit, anthropometric and clinical parameters were recorded, including body weight, BMI, and Modified Ferriman–Gallwey (mFG) score. Age was recorded

at baseline, while medication name and dose, adherence to dietary modification, and spontaneous fertility status were documented prospectively throughout follow-up.

The final analytical dataset included complete measurements of weight, BMI, and mFG score for all 27 participants across all seven assessment points; therefore, no imputation was required for the primary outcome variables. Body weight was recorded in kilograms, BMI was calculated in kg/m^2 and recorded to two decimal places, and hirsutism severity was assessed using the Modified Ferriman–Gallwey scoring system at each evaluation.

The available records did not provide sufficient information regarding weighing-device calibration, standardized height measurement procedures, examiner training or inter-rater reliability for mFG assessment, or control of cosmetic hair-removal practices. Therefore, only documented methodological procedures were considered in the analysis, and undocumented procedures were not assumed.

Clinical Management

Clinical management during the six-month follow-up period was determined by the treating clinicians according to routine clinical practice and was not assigned as part of a research intervention. Treatment decisions could be influenced by individual clinical response, previous weight-management efforts, pregnancy considerations, and patient preferences. Medication name and dose were documented at each follow-up visit whenever available.

Because pharmacological exposure was not randomized, differed between participants, and could be modified during follow-up, medications were not evaluated as comparative therapeutic interventions. Instead, medication use was considered descriptive clinical information and was not included as the primary explanatory variable in the analysis.

Dietary modification was documented during follow-up as part of routine clinical care; however, because dietary interventions were not standardized or independently controlled, diet modification was not analyzed as an individual intervention effect.

Spontaneous fertility status was recorded at baseline and during subsequent follow-up visits. These observations were considered descriptive clinical characteristics and were not included as primary or secondary outcome measures in the present analysis.

Study Outcomes

The primary outcome was the change in clinical hirsutism severity assessed by the Modified Ferriman–Gallwey (mFG) score from baseline to month 6. Improvement in mFG score was defined as the reduction in score over the follow-up period, calculated as:

A positive value indicated a decrease in hirsutism severity, with higher values representing greater numerical improvement.

The primary exposure variable was the percentage reduction in body weight from baseline to month 6. Percentage weight loss was calculated using the standard formula:

$$\text{Percentage weight loss (\%)} = \frac{\text{Baseline weight (kg)} - \text{Month 6 weight (kg)}}{\text{aseline weight (kg)}} \times 100$$

Secondary outcomes included absolute change in body weight, change in BMI, and longitudinal changes in weight, BMI, and mFG score throughout the six-month follow-up period. The proportion of participants achieving predefined weight-loss thresholds was also evaluated, including ≥5%, ≥7.5%, and ≥10% reduction from baseline body weight.

In addition, the association between the magnitude of weight reduction (percentage and absolute weight loss) and improvement in mFG score was assessed as the primary analytical relationship of interest.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics version 27. Continuous variables were summarized as mean ± standard deviation (SD), while median and interquartile range (IQR) were reported for non-normally distributed variables. The Shapiro–Wilk test was used to assess data distribution.

Baseline-to-month 6 changes were analyzed using paired-samples t-test for normally distributed variables and Wilcoxon signed-rank test for non-normally distributed variables. Changes across the seven follow-up time points were assessed using the Friedman test. The association between percentage weight loss and mFG score improvement was evaluated using Spearman rank correlation. A secondary analysis assessed the relationship between absolute weight loss and mFG improvement. All statistical tests were two-tailed, and a p-value <0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the Ethical Review Committee of Combined Military Hospital (CMH), Kharian under approval number A/26/98. Written informed consent was obtained from all participants before enrollment. The study was conducted in accordance with institutional ethical requirements and the principles of the Declaration of Helsinki.[9]

RESULTS

A total of 27 women were included in the final analysis, with complete body weight, BMI, and Modified Ferriman–Gallwey (mFG) measurements available across the seven assessment time points from baseline to month 6. The mean age of participants was 34.30±2.49 years. At baseline, mean body weight was 82.00±3.46 kg, mean BMI was 31.11±2.25 kg/m², and mean mFG score was 18.19±3.06. Diet modification was documented in 26 (96.3%) participants at baseline, while a previous history of spontaneous conception was recorded in 5 (18.5%). Baseline characteristics are presented in Table-I.

Mean body weight decreased from 82.00±3.46 kg at baseline to 76.00±3.61 kg at month 6, corresponding to a mean reduction of 6.00±2.27 kg (95% CI: 5.10–6.90; p<0.001). Mean percentage weight loss was 7.30±2.67%. Twenty-two participants (81.5%) achieved at least 5% weight loss, 15 (55.6%) achieved at least 7.5% weight loss, and 4 (14.8%) achieved at least 10% weight loss.

Mean BMI decreased from 31.11±2.25 kg/m² to 28.80±1.99 kg/m², representing a mean reduction of 2.31±0.92 kg/m² (95% CI: 1.95–2.68; p<0.001). Mean mFG score decreased from 18.19±3.06 at baseline to 13.67±2.79 at month 6. The mean numerical reduction in mFG score was 4.52±2.08 points, while the median improvement was 5 points (IQR 2–6). The baseline-to-month-6 reduction in mFG score was statistically significant (Wilcoxon signed-rank test, p<0.001) as shown in Table-II.

Values at baseline and month 6 are mean±SD. Weight and BMI were analyzed using paired-samples t-tests. mFG change was analyzed using the Wilcoxon signed-rank test. The median mFG improvement was 5 points (IQR 2–6). CI: confidence interval.

TABLE-I

Baseline characteristics of the study cohort (n=27)

Characteristic	Value
Age (years), mean±SD	34.30±2.49
Weight (kg), mean±SD	82.00±3.46
BMI (kg/m²), mean±SD	31.11±2.25
mFG score, mean±SD	18.19±3.06
Diet modification followed, n (%)	26 (96.3)
Previous spontaneous conception, n (%)	5 (18.5)

BMI: body mass index; mFG: modified Ferriman–Gallwey; SD: standard deviation.

TABLE-II

Changes in anthropometric measures and mFG score at six months

Outcome	Baseline	Month 6	Reduction	P-Value
Weight (kg)	82.00±3.46	76.00±3.61	6.00±2.27 (95% CI 5.10–6.90)	<0.001
BMI (kg/m²)	31.11±2.25	28.80±1.99	2.31±0.92 (95% CI 1.95–2.68)	<0.001
mFG score	18.19±3.06	13.67±2.79	4.52±2.08*	<0.001

Mean values showed progressive reductions in body weight, BMI, and mFG score during the six-month follow-up period as shown in Table-III. Mean weight decreased from 82.00 kg at baseline to 76.00 kg at month 6, while mean BMI decreased from 31.11 to 28.80 kg/m². Mean mFG score decreased from 18.19 at baseline to 13.67 at month 6. Friedman analysis demonstrated significant longitudinal changes across the seven assessment points for body weight (χ^2=154.22, p<0.001), BMI (χ^2=154.39, p<0.001), and mFG score (χ^2=141.49, p<0.001).

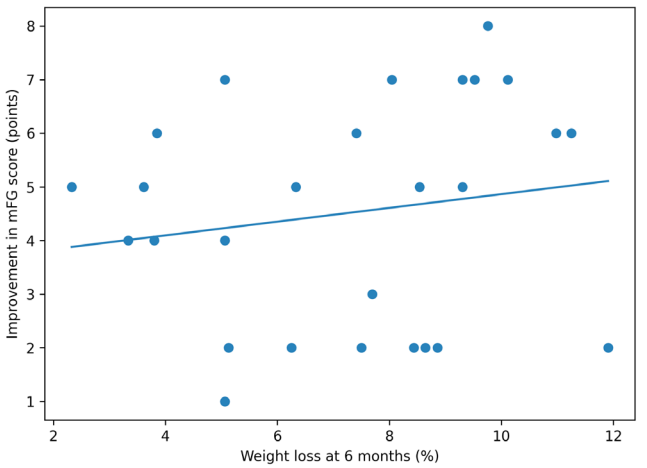
TABLE-III

Monthly mean anthropometric and mFG measurements during follow-up

Month	Mean Weight (kg)	Mean BMI (kg/m²)	Mean mFG score
Baseline	82	31.11	18.19
1	81.04	30.71	18.15
2	80.19	30.39	17.26
3	78.81	29.86	16.48
4	77.59	29.39	15.41
5	76.44	28.96	14.41
6	76	28.8	13.67

FIGURE-1

Association between percentage weight loss and improvement in Modified Ferriman–Gallwey score



The primary correlation analysis showed a weak positive relationship between percentage weight loss and mFG improvement; however, this association was not statistically significant (Spearman ρ=0.250, p=0.208). Absolute weight loss was also weakly and non-significantly correlated with mFG improvement (Spearman ρ=0.274, p=0.167). Thus, participants who lost a greater percentage or absolute amount of body weight did not consistently demonstrate greater improvement in mFG score during the six-month period as shown in Figure-1.

DISCUSSION

This prospective cohort study documented substantial six-month reductions in mFG score among 27 women with PMOS who achieved weight loss. Mean weight decreased by 6.0 kg and mean BMI by 2.31 kg/m², while the mean mFG score fell by 4.52 points. The mean percentage weight loss was 7.30%, and 81.5% of participants achieved at least 5% weight loss. The median improvement in mFG score was 5 points, with progressive reductions in weight, BMI and mFG score observed across the six-month follow-up. The principal finding, however, was that the magnitude of percentage weight loss was only weakly and non-significantly correlated with mFG improvement. Therefore, the study demonstrates concurrent within-participant improvement in anthropometric measures and hirsutism score, but does not demonstrate that greater weight loss was accompanied by proportionally greater improvement in hirsutism.

The overall anthropometric improvement is consistent with contemporary evidence showing that weight-management strategies can improve anthropometric and metabolic outcomes in women with PCOS/PMOS. A 2024 systematic review and meta-analysis by Benham et al. reported improvements in anthropometric, metabolic, hormonal and selected reproductive outcomes following bariatric surgery in women with PCOS, although the certainty and consistency of evidence varied across outcomes.[10] In the BAMBINI multicentre randomized controlled trial, bariatric surgery resulted in significantly more spontaneous ovulatory events than behavioural and medical care among women with PCOS and obesity.[11] These studies support the broader importance of weight management in PCOS/PMOS; however, their principal anthropometric, metabolic and reproductive outcomes differ from the mFG outcome assessed in the present study. Therefore, their findings cannot be directly extrapolated to clinical hirsutism, particularly because the present study did not demonstrate a significant relationship

between the magnitude of weight loss and mFG improvement.

The present study specifically focused on hirsutism quantified by mFG score. The finding that mFG score improved substantially while its magnitude of improvement was not significantly related to the amount of weight lost suggests that changes in clinical hirsutism may not be determined by weight reduction alone. PCOS/PMOS is phenotypically and biologically heterogeneous, with variation in reproductive, androgenic and metabolic characteristics. Cluster analysis has identified distinct hormonal subgroups among women with PCOS, including a subgroup characterized by higher LH, free androgen index and androstenedione levels, with androgen measures also showing associations with metabolic risk.[12] while genomic studies also support heterogeneous mechanistic pathways involving adiposity, insulin resistance and reproductive factors.[13] Such underlying biological heterogeneity may partly contribute to the variation in mFG improvement observed among women achieving similar degrees of weight loss, although these genetic studies did not directly assess hirsutism response to weight reduction.[14,15] The mFG score is a clinical measure of terminal hair growth rather than a direct measure of circulating androgen concentrations; therefore, changes in clinical hirsutism should not be assumed to parallel changes in anthropometric or biochemical parameters.[16]

Although the reduction in mFG score was statistically significant and numerically substantial, it cannot be attributed to weight loss alone. Participants received heterogeneous clinician-directed therapy and treatment exposure changed during follow-up in some participants. Contemporary evidence indicates that metformin can influence several relevant anthropometric, metabolic and androgen-related outcomes. A 2022 systematic review and meta-analysis of randomized controlled trials found that metformin was associated with reductions in body weight, BMI, fasting glucose, total testosterone and androstenedione in women with PCOS.[17] Lifestyle modification may also improve reproductive and selected metabolic outcomes in women with PCOS, although the magnitude of benefit varies according to the type of intervention and the outcomes assessed.[18] In addition, the 2023 International Evidence-based Guideline for PCOS states that anti-obesity medications, including GLP-1 receptor agonists such as semaglutide, may be considered for the management of higher weight in adults with PCOS, alongside active lifestyle intervention.[2,19] A 2023 study of semaglutide in women with PCOS and obesity who had not responded to lifestyle intervention reported substantial weight loss, with normalization of menstrual cycles in 80% of participants who achieved >5% weight loss and continued treatment for six months.[8] These data are relevant because some participants in the present cohort received weight-management pharmacotherapy; however, the study was neither randomized nor designed to estimate treatment-specific effects. Accordingly, the observed improvement in mFG score cannot be attributed specifically to weight loss and may have been influenced by a combination of weight change, lifestyle modification, pharmacological treatment, underlying endocrine variation, and natural within-person variation.

The observed mean percentage weight loss of 7.3% was accompanied by 22 of 27 participants achieving at least 5% weight loss. Contemporary evidence on lifestyle management in PCOS emphasizes individualized, PCOS-specific lifestyle support and recognizes the adverse effects of weight stigma and overly weight-centric care.[20] Data were collected prospectively with repeated monthly observations, permitting evaluation of trajectory rather than only two isolated measurements. The mFG score provided a standardized clinical measure of hirsutism severity. Complete weight, BMI and mFG data were available for all 27 women at all seven assessment points, avoiding the need for missing-data handling for the principal longitudinal outcomes. The progressive monthly pattern also demonstrated that the observed changes were not dependent solely on comparisons between baseline and month 6. The use of within-participant analyses allowed changes over time to be evaluated while accounting for the paired nature of the observations. Together, these features strengthened the longitudinal characterization of anthropometric and mFG changes within the study cohort.

The main limitations of this study were the small sample size, restriction of the analytic cohort to women who achieved weight loss, absence of a control group, and heterogeneous clinician-directed treatment. These factors limit generalizability and preclude causal inference. Restricting the cohort to weight-loss responders also narrowed the range of the primary exposure and may have reduced the ability to detect an association between percentage weight loss and mFG improvement. In addition, the available records did not document examiner standardization or cosmetic hair-removal practices for mFG assessment, and biochemical androgen, insulin-resistance, menstrual-frequency, and validated ovulation measurements were not available for adjustment. The observed median 5-point improvement in mFG score should therefore not be interpreted as an established minimal clinically important difference.

Future studies should include larger, unselected prospective cohorts with standardized mFG assessment, biochemical and metabolic measurements, menstrual and ovulatory outcomes, and detailed time-varying treatment exposure. In sufficiently large datasets, longitudinal mixed-effects modelling could evaluate whether changes in weight or BMI are independently associated with changes in mFG score after adjustment for relevant confounders and whether a clinically meaningful dose-response pattern exists.

CONCLUSION

Among 27 women with PMOS who achieved weight loss during six months of prospective follow-up, body weight, BMI, and mFG score decreased significantly. Mean weight loss was 6.00 kg, while the median improvement in mFG score was 5 points. However, the magnitude of percentage weight loss was not significantly associated with the magnitude of mFG improvement. These findings indicate concurrent improvement in anthropometric measures and hirsutism severity but do not demonstrate a dose-response relationship or establish that weight loss itself caused the improvement in mFG score.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
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2	**Iqra Saeed:** Data collection.
3	**Jamal Waris:** Writing, data analysis.
4	**Muhammad Usman Sajid:** Data entry.
5	**Fuad Ahmad Siddiqui:** Methods.
6	**Syed Rizwan Hussain:** Critical revisions.
7	**Hassan Shabbir:** Data analysis.
8	**Tehseen Ashraf Kohistani:** References.