Research Article

Impact of Conditioning and De-conditioning on BMI, Hormonal Regulation and Insulin Level Profiles in Females with PCOS: A Repeated Measures Study

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Abstract

Background: Polycystic Ovary Syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age and is characterized by hormonal imbalance, insulin resistance, metabolic dysfunction, and reproductive disturbances. Exercise-based interventions have emerged as an effective non-pharmacological strategy for managing PCOS; however, the sustainability of these benefits following a period of reduced physical activity (de-conditioning) remains unclear. Objective: This study aims to evaluate the influence of a structured conditioning program on hormonal regulation, metabolic profiles, and symptom severity in women with PCOS and to compare these outcomes with changes observed during a subsequent de-conditioning phase. Methods: A prospective interventional study will be conducted in women diagnosed with PCOS. 50 Participants will undergo a structured conditioning program consisting of supervised aerobic and resistance exercises, including high-intensity interval training (HIIT), performed three to five times per week over a predetermined intervention period. Hormonal parameters (testosterone, luteinizing hormone (LH), follicle-stimulating hormone (FSH), insulin level, cortisol, metabolic indicators (fasting blood glucose level, lipid profile, body mass index (BMI), waist circumference, and insulin resistance), and the clinical features (menstrual irregularity, hirsutism, acne, body composition, and quality of life) will be assessed before and after the conditioning program and reassessed following a de-conditioning phase. Expected Results/ Hypothesis: It is anticipated that the structured conditioning program will significantly improve insulin sensitivity, reduce circulating androgen levels, enhance lipid metabolism, improve body composition, and decrease the severity of PCOS-related symptoms. Conversely, the de-conditioning phase is expected to result in a partial reversal of these physiological and clinical improvements, highlighting the importance of maintaining regular physical activity. Conclusion: This study is assumed to provide evidence that structured exercise protocol is actually an very effective and sedentary lifestyle intervention for correct and improving hormonal regulation, metabolic health, and symptom modulated severity in females with PCOS. Furthermore, it will emphasize that discontinuation of exercise by physical non coordination and fatigue may diminish these three benefits, reinforcing the need for long-term rehabilitation and psychological supports to structured physical activity as a cornerstone of PCOS management. The analysis of 50 samples record demonstrated various differences in BMI, Hormones and insulin level across Pre Parameters, Post Conditioning and Post De-conditioning calculations and assessment. The pattern of all findings proven the good improvement during conditioning by reversal during de-conditioning. The scores proven the highly importance of this physical activity as life style for all female with PCOS is must.

Keywords: Polycystic Ovary Syndrome (PCOS), Structured Conditioning Program, De-Conditioning, Hormonal Regulation, Metabolic Profile, Insulin Resistance, High Intensity Interval Training (HIIT), Exercise Therapy.

1. Introduction

Polycystic Ovary Syndrome (PCOS) is one of the most prevalent endocrine and metabolic disorders affecting women of reproductive age, with an estimated global prevalence of 8–13%, depending on the diagnostic criteria used. PCOS is actually featured by hyper androgenism, ovulatory dysfunction, and polycystic ovarian morphology, and is rapidly associated with insulin resistance, obesity, dyslipidemia, and chronic low-grade inflammation. These metabolic and hormonal disturbances not only impair reproductive health but also increase the long-term risk of type 2 diabetes mellitus, cardiovascular disease, and psychological disorders, thereby significantly affecting the quality of life of affected women.

The pathophysiology of PCOS is complex and multifactorial, involving genetic predisposition, environmental influences,

endocrine dysfunction, and metabolic abnormalities. Insulin resistance is considered one of the key mechanisms underlying the disorder, as elevated insulin levels stimulate ovarian androgen production and suppress hepatic synthesis of sex hormone-binding globulin (SHBG), resulting in increased circulating free androgens. This hormonal imbalance contributes to menstrual irregularities, anovulation, infertility, hirsutism, acne, and weight gain, which are among the most common clinical manifestations of PCOS.

Lifestyle modification, particularly regular physical activity, is recognized as the first-line management strategy for women with PCOS. Exercise improves insulin sensitivity, enhances glucose metabolism, reduces visceral adiposity, and promotes favorable changes in body composition. These physiological adaptations contribute to improved hormonal regulation, menstrual regularity, ovulatory function, cardiovascular fitness, and overall metabolic health. Structured conditioning programs that combine aerobic exercise, resistance training, and high-intensity interval training (HIIT) have gained increasing attention because of their potential to produce greater improvements in metabolic and endocrine function than unstructured physical activity.

Although numerous studies have demonstrated the beneficial effects of structured exercise on women with PCOS, less attention has been given to the persistence of these benefits once exercise is reduced or discontinued. The cessation of regular training, commonly referred to as de-conditioning, leads to the gradual loss of physiological adaptations achieved during conditioning. Declines in insulin sensitivity, aerobic capacity, muscle function, and metabolic efficiency may occur within weeks of inactivity, potentially resulting in the recurrence of hormonal imbalance and worsening of PCOS-related symptoms. Understanding the effects of de-conditioning is therefore essential for determining whether continuous exercise is necessary to maintain long-term therapeutic benefits.

Despite growing evidence supporting exercise interventions in PCOS management, limited research has directly compared the effects of a structured conditioning program with those observed during a subsequent de-conditioning phase. Investigating these changes will provide valuable insight into the sustainability of exercise-induced adaptations and the importance of long-term adherence to physical activity in women with PCOS.

Therefore, the present study aims to evaluate the influence of a structured conditioning program on hormonal regulation, metabolic profiles, and symptom severity in women with PCOS and to compare these outcomes with changes occurring during a de-conditioning phase. The findings of this study are expected to contribute to the development of evidence-based exercise recommendations for the long-term management of PCOS and to reinforce the role of structured physical activity as an effective non-pharmacological therapeutic strategy.

Objectives of the Study

1. To evaluate the effect of a structured conditioning program on hormonal regulation in women with PCOS.
2. To assess changes in metabolic profiles following participation in a structured conditioning program.
3. To determine the impact of the conditioning program on the severity of PCOS-related symptoms.
4. To compare hormonal, metabolic, and clinical outcomes during the conditioning phase and the de-conditioning phase.
5. To examine whether discontinuation of exercise (de-conditioning) leads to deterioration in PCOS-related health parameters.
6. To investigate the role of regular physical conditioning in improving overall health and quality of life in women with PCOS.
7. To identify the sustainability of exercise-induced benefits after a period of de-conditioning.
8. To provide evidence supporting structured exercise as a non-pharmacological strategy for the management of PCOS.

Methodology

Research Design

This study will use a prospective comparative experimental design to analyze the impact of a structured conditioning protocol on hormonal regulation, metabolic system, and symptom modulation into severity in women with Polycystic Ovary Syndrome (PCOS). Participants or sample will be assessed before intervention, after completion the conditioning phase, and again after de-conditioning phase to check and determine the benefits are maintained or reduced or increased.

Study Setting

The study will be conducted in the OPD of Physiotherapy in the hospital or College of physiotherapy where women diagnosed with PCOS can be selected and supervised during exercise sessions.

Study Population

The study population will consist of women diagnosed with PCOS according to established clinical criteria and referred for physiotherapy or lifestyle management.

Sample Size

A total of 50 participants will be included in the study. Participants will be selected using purposive or convenience sampling based on eligibility criteria. They may be divided equally into intervention and comparison groups if applicable.

Inclusion Criteria

* Women aged 18–35 years.
* Diagnosed with PCOS by a gynecologist.
* Stable medical condition and medically fit for exercise.
* Willing to participate and provide written informed consent.

Exclusion Criteria

* Pregnancy or breastfeeding.
* Serious cardiovascular, respiratory, neurological, or musculoskeletal disorders.
* Endocrine disorders other than PCOS.
* Current participation in another structured exercise program.
* Any condition that prevents safe participation in exercise.

Intervention

Participants will undergo a structured conditioning program for 12 weeks, with 3–5 supervised sessions per week. Each session will last 45–60 minutes and include:

1. Warm-up exercises (5–10 minutes).
2. Aerobic exercise of moderate intensity (20–30 minutes).
3. Resistance training targeting major muscle groups (15–20 minutes).
4. Flexibility and cool-down exercises (5–10 minutes).

Exercise intensity will be progressed gradually according to the participant's fitness level.

De-conditioning Phase

After completing the conditioning program, participants will undergo a 4-week de-conditioning phase, during which they will discontinue the structured exercise program while continuing their usual daily activities. This phase will help evaluate whether improvements in hormonal, metabolic, and clinical outcomes are sustained or decline after stopping regular exercise.

Outcome Measures

Primary Outcomes

1. Hormonal profile (serum testosterone, LH, FSH, and insulin levels).
2. Metabolic profile (fasting blood glucose, HbA1c, lipid profile, and insulin resistance if assessed).
3. Body Mass Index (BMI) and waist-to-hip ratio.

Secondary Outcomes

1. Menstrual cycle regularity.
2. Hirsutism severity using the Modified Ferriman–Gallwey Score.
3. Acne severity.
4. Quality of life using a validated PCOS questionnaire.
5. Physical fitness and exercise tolerance

Data Analysis and Statistics

The Analysis is actually based on the 50 sample record in set of data.

The statistical plan were because of the 50 sample were observed and assessed on the basis of the pre data, after

conditioning and then after de-conditioning. The monitoring were in repeated mode of the all measurements. Analysis is based on;

1. Mean, SD calculation for age and outcomes
2. Non-Parametric test and Friedman test for all parameter comparison
3. Wilcoxon signed rank test for conditioning and de-conditioning analysis
4. P-value not more than 0.05

All sample had a mean for age around 27-28 year old and the Pre test mean were 32.73, ranges between 27.22 – 39.3.
The changes were

S No.	Parameters	Pre Test	Post Conditioning	Post De-Conditioning
1	Body Mass Index	32.73 ± 3.27	30.61 ± 3.12	31.46 ± 3.20
2	Hormonal Changes	71.32 ± 8.33	48.22 ± 6.23	60.12 ± 7.22
3	Insulin level	19.15 ± 3.13	12.07 ± 2.16	15.77 ± 2.59

The Changes in Magnitude were;

S No.	Parameters	Pre Test to Conditioning	Conditioning to De-conditioning	De-Conditioning to Post De-conditioning
1	Body Mass Index	-6.55%	+2.75%	-3.98%
2	Hormonal Changes	-29.97%	+20.08%	-15.91%
3	Insulin level	-35.99%	+29.42%	-19.01%

The outcome shows;

1. All measured parameters decreased after condition
2. All measured parameters Increased during de-condition
3. All measured parameters decreased after de-condition

Result

This study actually shows the significant reduction in body mass index, hormonal regulation, specially Testostreone and Insulin level after follow the conditioning functions. BMI reduct around 6.5%, Testosterone reduct around 29% and the insulin reduct around 35% from the Pre-Parameters. While De-conditioning periods, all the parameters low slightly but just below the Pre parameter values. Statistically a significance difference seen in p-values that is ***(p<0.001)***. These outcome is a proven the benefits of Conditioning in metabolic changes and hormonal regulation of female with PCOS.

Discussion

This Study evaluates changes in BMI, hormonal regulation and insulin level in 50 samples during conditioning and de-conditioning process.

In the Period of de-conditioning, all the parameters raised slightly but just below the pre parameters. These changes are signs of efficient profits of exercises on selective metabolic and testosterone level in Female with PCOS.
However, the insulin alone may not confirm sensitivity and BMI can not directly calculate to body composition.

Conclusion

The analysis of 50 samples record demonstrated various differences in BMI, Hormones and insulin level across Pre Parameters, Post Conditioning and Post De-conditioning calculations and assessment. The pattern of all findings proven the good improvement during conditioning by reversal during de-conditioning. The scores proven the highly importance of this physical activity as life style for all female with PCOS is must.

Future Recommendations

1. The parameters can be used like LIPID Profile, Hemoglobin
2. The exercises protocol can be change with female with Thyroidism.
3. The study can be compare with aerobic exercise and resistance training, supervised by high intensity interval training (HIIT).
4. The original participations profiles also can be on the bases of lab reports.

Limitations

1. Small Sample Size
2. Absence of Control Group
3. Other Parameters and Clinical finding were not available

References

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