



**ORIGINAL RESEARCH PAPER**

**Physiotherapy**

**EFFECTS OF AEROBIC TRAINING PROGRAM AND LIFESTYLE MODIFICATION IN OBESE WOMEN WITH POLYCYSTIC OVARY SYNDROME**

**KEY WORDS:** polycystic ovary syndrome (PCOS), hyperandrogenism, anovulation, oligomenorrhea, amenorrhea, aerobic exercise, lifestyle modification.

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**ABSTRACT**

**Introduction:** Both polycystic ovary syndrome (PCOS) and obesity are the raising epidemics in the world today. It is one of the most common endocrine disorder among women associated with reproductive, metabolic and psychological features affecting 5-10% of women of reproductive age. The syndrome is characterised by polycystic ovaries, anovulation and hyperandrogenism. Approximately 30% to 60% women with PCOS are obese (defined as a BMI >30kg/m<sup>2</sup>). Obesity may play a pathogenic role in the development of the syndrome. Therefore, aerobic exercise and lifestyle modification with appropriate diet is a corner stone of therapy for many women with PCOS.

**Objective:** To evaluate the benefits of aerobic exercise program along with lifestyle modification on weight reduction, quality of life in obese women with PCOS.

**Materials and Methods:** A total of 30 PCOS obese women aged 17-23 underwent a 8-week training session. The subjects were included in the study based on the inclusion and exclusion criteria and were divided into two groups. In group A (n=15) the subjects were given aerobic exercise and lifestyle modification whereas in group B (n=15) the subjects were given only aerobic exercise. Anthropometric parameters (body mass index and waist to hip ratio) were assessed and compared at the baseline and after the 8-week training session.

**Result:** After a 8-week training session, in group A the BMI reduced from 30.40kg/m<sup>2</sup> to 29.36kg/m<sup>2</sup> and WHR reduced from 0.84 to 0.80 whereas in group B the BMI reduced from 30.08kg/m<sup>2</sup> to 29.64kg/m<sup>2</sup> and WHR reduced from 0.83 to 0.82.

**Conclusion:** This study concluded that aerobic training along with lifestyle modification improves obesity indices (body weight and waist circumference) in women with PCOS. Also, there is improvement in the quality of life.

**INTRODUCTION:**

In women, polycystic ovary syndrome is the most common endocrine disorder. It is characterized by hyperandrogenism, anovulation and polycystic ovaries<sup>[1]</sup>. The prevalence rate estimated was 4-8%. PCOS affects both the reproductive and metabolic systems. The features include hyperandrogenism, menstrual dysfunction, infertility, an increased prevalence rate of obesity and pregnancy complication. There is also increased probability risk factor for diabetes mellitus and cardiovascular disease which includes endothelial dysfunction, inflammation, hypertension, impaired glucose tolerance and hyperlipidemia. In PCOS there is also a chance of getting gestational diabetes<sup>[2]</sup>.

PCOS women most commonly undergo oligomenorrhea, amenorrhea and prolonged erratic menstrual bleeding. Around 30% of women suffering from PCOS will have normal menses<sup>[3]</sup>. Approximately 30-40% of women with PCOS will have amenorrhea while 85-90% of women with PCOS will undergo oligomenorrhea<sup>[4]</sup>. Excess of androgen can be seen in more than 80% of women who have PCOS<sup>[5]</sup>. About 70% of women with PCOS show hirsutism which is common clinical presentation of hyperandrogenism<sup>[6]</sup>. In this condition hair growth occurs at three sites: upper lip, chin/face, back, abdomen, arms and thighs<sup>[7]</sup>. Acne can also be one of the clinical presentations of hyperandrogenism but is less specific than hirsutism and is less prevalent in PCOS<sup>[8]</sup>. Over 40% of women were diagnosed with PCOS who presented with severe acne<sup>[9]</sup>.

About 40% of women with PCOS have infertility<sup>[10]</sup>. Anovulatory infertility is most commonly caused because of PCOS. About 90-95% anovulatory women have PCOS who refer to the infertility clinics. Women with PCOS have significant increase in primary and secondary follicles and

have normal number of primordial follicles. There is an arrest in follicular growth as the diameter of follicle reach up to 4-8mm, this occurs due to derangements in factors involved in normal follicular development. Ovulation does not occur as there is no development in dominant follicle. Because of this, about 42-73% of PCOS women suffer from spontaneous abortion more frequently<sup>[10,11,12]</sup>.

PCOS is closely associated with obesity. Between 40-80% of PCOS women are overweight or obese. There is an increased incidence of obesity worldwide. The history of weight gain suggests a pathogenetic role of obesity in the subsequent development of the syndrome<sup>[13, 14]</sup>. Because of several abnormalities of sex steroid metabolism there is increased adiposity and increase in androgen production and suppression of sex hormone binding globulin<sup>[15]</sup>K

For curing PCOS, the treatment should mainly focus on normalizing the signs of hyperandrogenism and anovulation and on reducing complications of metabolism. This can be achieved by pharmaceutical interventions which primarily focus on reproductive dysfunction and insulin resistance. Oral contraceptive pills and Metformin are given to improve reproductive dysfunction and insulin resistance respectively. Despite this available treatment, the first line management for PCOS will always be weight reduction. This can be achieved through aerobic exercise but there is no significant review that shows the independent effect of exercise on cardiovascular and reproductive outcomes. So, along with aerobic exercise lifestyle intervention will help in improving practically every parameter of PCOS.

Lifestyle modification and aerobic exercise include weight reduction and improvement in cardiovascular risk factors and reproductive dysfunction. Lifestyle modification includes

increased physical activity and dietary intervention with energy restriction.

In obese PCOS women, weight loss helps in restoring ovulation and pregnancy rates, diminishes acanthosis nigricans, decreases insulin level, improves psychological considerations and raises sex hormone binding globulin (SHBG) while lowering testosterone levels<sup>[16,17,18]</sup>.

The reduction in weight was measured by using the body mass index, waist to hip ratio and PCOS quality of life questionnaire.

The main purpose of this study is to evaluate the benefits of aerobic exercise and lifestyle modifications on obese women with polycystic ovary syndrome.

**MATERIALS AND METHODS:**

30 females within the age group 17 to 23 years who are clinically diagnosed as PCOS and having body mass index above 28kg/m<sup>2</sup>, waist to hip ratio above 0.8 were included for the study. Subjects with normal body mass index, cancer, liver dysfunction, alcohol intake, smoking, cardiovascular disease were excluded.

**PROCEDURE:**

A total of 30 subjects were taken and were divided into two groups

GROUP A: Aerobic training and lifestyle modification (n=15)

GROUP B: Aerobic training (n=15)

**FOR GROUP A:**

The subjects were asked to fill the PCOS questionnaire which consisted of 23 items and the subjects were answering in “yes” or “no”, where “yes” represented the presence of any symptoms.

The training course included 3 sessions per week each lasting 40-60 minutes. The first 5-6 minutes in each session was for warm up, the next 30-45 minutes for exercise and last 5-7 minutes for cooling down.

Warm up exercise included walking, jogging, stretching, rotation at various joints, walking on heels and toes, forward bend, backward bend, sideward stretch, rotation of shoulder joints and hip joints, stretching of calf and quadriceps muscle groups.

Between sessions the participants had 5-7 minutes active resting period.

At the end of each one, slow stretching exercises were performed to return the body to initial stage.

**AEROBIC EXERCISE:**

- a. Jumping jacks
- b. High - knees
- c. Alternate side lunges
- d. Skipping

**LIFESTYLE MODIFICATION:**

Lifestyle modification includes diet, exercise and behaviour therapy. The main aim is to educate individual’s principles and techniques to achieve dietary and exercise goals.

**a). DIETARY MODIFICATION:**

Increase the intake of fibre instead of carbohydrates. Fibre get digested slowly and hence a slow rise of blood sugar.

Include lots of whole foods in the diet and cut down on junks, processed foods, soda, fruit juices, candy, cookies and ice-cream.

Limit sugars and enriched carbohydrates.

Low salt intake rather use lemon juices, mustard, vinegar, pepper, herbs and spices.

Include almonds, walnuts and flaxseeds<sup>[18]</sup>.

**b). BEHAVIOURAL THERAPY:**

Mental health is vital for healthy lifestyle. Females fear regarding loss of femininity and sexuality, infertility, body image and lower self-worth contributes to poorer mental health outcomes.

Relaxation (eg: breathing exercises) helps to reduce stress and cortisol secretion which is often present in PCOS women<sup>[19]</sup>.

**c). EXERCISE:**

The subjects were asked to be physically more active this will help to reduce weight or at least maintain weight. For example, small changes like using stairs instead of elevators or walking small distance where vehicle is not needed<sup>[18]</sup>.

**FOR GROUP B:**

The training course included 3 sessions per week each lasting 40-60 minutes. The first 5-6 minutes in each session was for warm up, the next 30-45 minutes for exercise and last 5-7 minutes for cooling down.

Warm up exercise included walking, jogging, stretching, rotation at various joints, walking on heels and toes, forward bend, backward bend, sideward stretch, rotation of shoulder joints and hip joints, stretching of calf and quadriceps muscle groups.

Between sessions the participants had 5-7 minutes active resting period.

At the end of each one, slow stretching exercises were performed to return the body to initial stage.

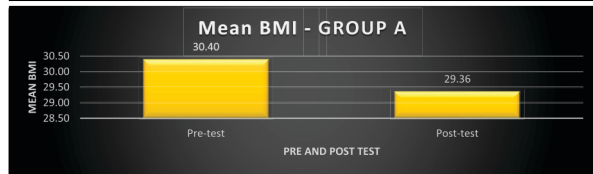
The subjects were instructed to these following exercises:

- Jumping jacks
- High knees
- Alternate side lunges
- Skipping

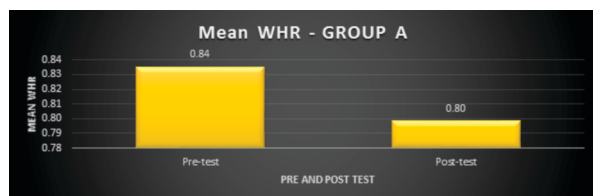
**STATISTICAL ANALYSIS:**

**Table 1: Group A - shows pre and post mean, SD and p values of BMI and WHR**

Outcome Measures	Mean		SD		t-Value	p-Value
	Pre-test	Post-test	Pre-test	Post-test		
BMI	30.40	29.36	1.12	1.24	7.35	<0.0001
WHR	0.84	0.80	0.05	0.06	17.39	<0.0001



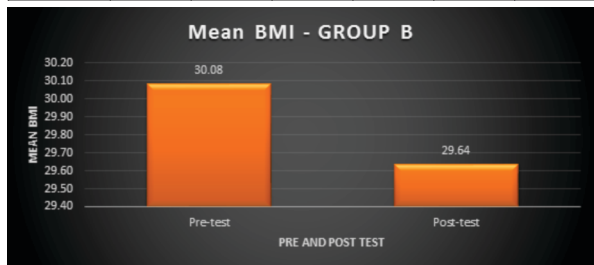
**Fig: 1.1**



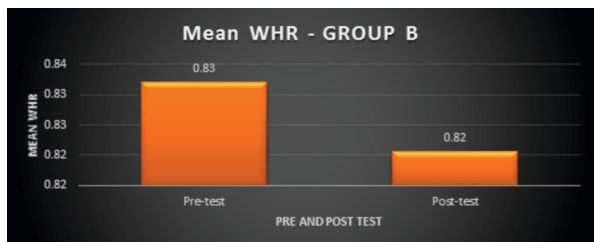
**Fig: 1.2**

**Table 2: Group B- shows pre and post mean, SD and p values of BMI and WHR**

Outcome Measures	Mean		SD		t-Value	p-Value
	Pre-test	Post-test	Pre-test	Post-test		
BMI	30.08	29.64	0.80	0.91	11.05	<0.0001
WHR	0.83	0.82	0.04	0.04	12.47	<0.0001



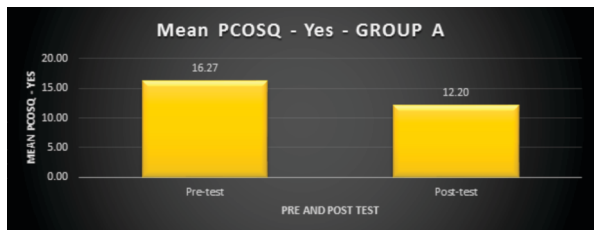
**Fig:1.3**



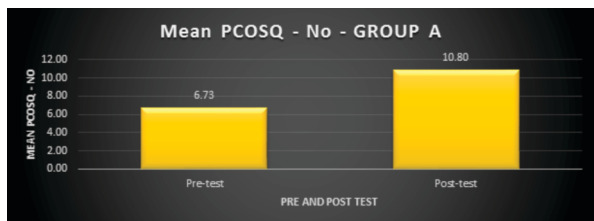
**Fig:1.4**

**PCOSQ: Table 3: Group A – shows pre and post mean and SD values of PCOSQ-yes and PCOSQ-no**

VARIABLES	YES		NO	
	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST
MEAN	16.27	12.20	6.73	10.80
SD	1.28	1.37	1.28	1.37



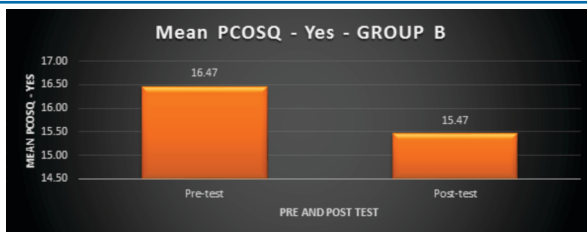
**Fig: 1.5**



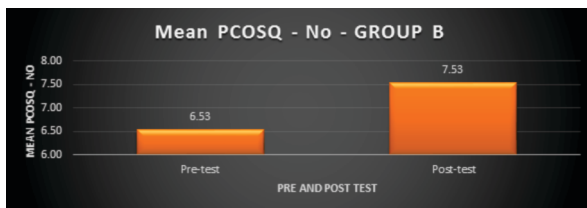
**Fig: 1.6**

**Table 4: Group B- shows pre and post mean and SD values of PCOSQ-yes and PCOSQ-no**

VARIABLES	YES		NO	
	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST
MEAN	16.47	15.47	6.53	7.53
SD	1.13	1.13	1.13	1.13



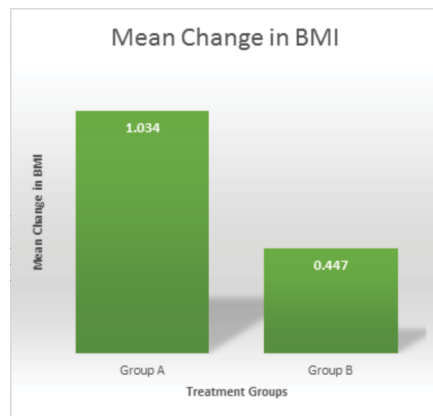
**Fig: 1.7**



**Fig:1.8**

**Comparing the groups, A and B in terms of reduction in BMI:**

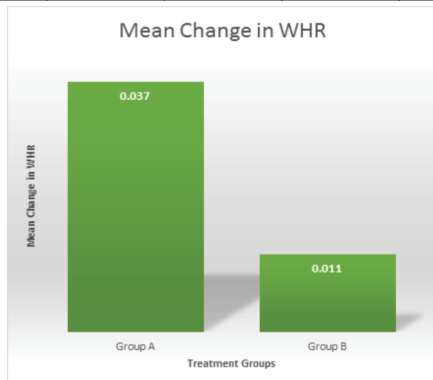
OUTCOME MEASURES	MEAN	SD	t-VALUE	p-VALUE
GROUP A	-1.03	0.55	-4.01	0.000
GROUP B	-0.45	0.16		



**Fig: 1.9**

**Comparing the groups A and B in terms of reduction in WHR**

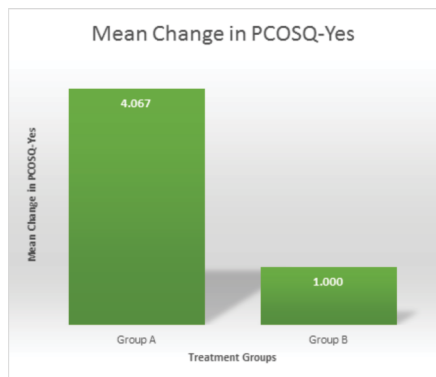
OUTCOME MEASURES	MEAN	SD	t-VALUE	p-VALUE
GROUP A	-0.04	0.01	-11.04	0.000
GROUP B	-0.01	0.00		



**Fig: 1.10**

**Comparing the groups, A and B in terms of reducing PCOSQ-yes:**

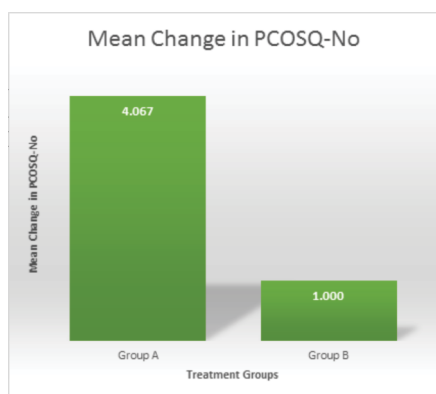
OUTCOME MEASURES	MEAN	SD	t-VALUE	p-VALUE
GROUP A	-4.07	0.26	-46.00	0.000
GROUP B	-1.00	0.00		



**Fig: 1.11**

**Comparing the groups, A and B in terms of improvement in PCOSQ- no:**

OUTCOME MEASURES	MEAN	SD	t-VALUE	p-VALUE
GROUP A	4.07	0.26	-46.00	0.000
GROUP B	1.00	0.00		



**Fig: 1.12**

**RESULT:**

30 PCOS women entered the study. Mean BMI of the patients in group A and B was 30.40 and 30.08 respectively. Mean WHR of the patients in group A and B was 0.84 and 0.83 respectively.

After an 8-week training session, there was a mean reduction in BMI by group A (1.034) is greater than that of group B (0.447) (p=0.000).

The mean reduction in WHR by group A (0.037) is greater than that of group B (0.011) (p=0.000).

The mean reduction in PCOSQ-yes by group A (4.07) is greater than that of group B (1.00) (p=0.000).

The mean increase in PCOSQ-no by group A (4.07) is greater than that of group B (1.00) (p=0.000).

The analysis showed that group A is effective than group B in terms of reducing the values of BMI, WHR, PCOSQ-yes (presence of any symptom) and increasing the value of PCOSQ-no (no symptoms).

**DISCUSSION:**

The main aim of this study is to reduce weight through aerobic training and lifestyle modification in obese women with PCOS.

After an 8-week training session, there was a significant reduction in weight in both the groups, but the weight reduction was more in group A (aerobics and lifestyle modification) than in group B (aerobics).

The alternate hypothesis formulated was to show a significant difference in the effect of aerobic exercise and lifestyle modification on obese women with polycystic ovary syndrome in terms of measures such as body mass index, waist to hip ratio and PCOS questionnaire.

In group A, the mean body mass index reduced from 30.40kg/m<sup>2</sup> to 29.36kg/m<sup>2</sup> and mean waist to hip reduced from 0.84 to 0.80. In group B, the mean reduction was from 30.08kg/m<sup>2</sup> to 29.64kg/m<sup>2</sup> and mean waist to hip ratio reduced from 0.83 to 0.82. This reduction in weight is because, the aerobic exercise enhances glycogen synthase activities and glucose disposal through increase in blood flow, skeletal muscle capillarization and hexokinase<sup>[1]</sup>. It is emphasized that lifestyle modification is the most preferred and most effective method of treatment for polycystic ovary syndrome<sup>[16]</sup>. Elevated insulin is thought to contribute to the endocrine abnormalities in PCOS, a reduction in insulin would be expected to ultimately result in an improved endocrine profile<sup>[20]</sup>.

In previous study, the result suggests that a eucaloric low CHO diet, which was relatively low in carbohydrate (43%) and cholesterol, high fiber and comprised of 45% fat (18% monosaturated fat and <8% saturated fat), improved the metabolic profile of women with PCOS within 16 days. This information may allow clinicians to modify treatment regimens to allow for dietary managements<sup>[20]</sup>.

Randeva et al showed that exercise such as regular walking help in reducing waist to hip ratio which is an indicator of diabetes and other morbidities and homocysteine levels also an indicator of cardiovascular risk in overweight women with polycystic ovary syndrome.

Previous studies have speculated that due to a tendency toward overeating, particularly sweet or starchy food women with polycystic ovary syndrome are obese.

This study shows that mean body mass index and mean waist to hip ratio difference between PCOS obese subjects was statistically significant. The long-term maintenance of weight loss is affected by negative factors in obese PCOS patients. The energy intake of obese women with PCOS was greater, this emphasis that women with PCOS should restrict significantly energy intake to maintain a normal weight. In the same way, the effect of exercise in long term could be less efficient in obese patients<sup>[16]</sup>. The American College of Sports Medicine (Jakicic et al, 2001) to facilitate long-term maintenance of weight loss and prevent weight regain in overweight and obese adults, a minimum of 200-300 minutes of moderate exercise (i.e. brisk walking) per week is recommended. It is supported by The International Association for the Study of Obesity (IASO) (Saris et al, 2003) who confirmed that to prevent the transition to overweight or obese then 45-60 minutes of moderate physical activity daily is required and for prevention of weight regain in formally obese individuals, a minimum of 60-90 minutes of moderate exercise daily (or less of vigorous exercise) is recommended<sup>[2]</sup>.

Among obese population long-term maintenance of weight loss is less likely. This problem is exaggerated in obese PCOS

subjects due to impressive correlation between lifestyle (physical activity and dietary intake), obesity and metabolic characteristics (Ayyad.C,2000).

Aerobic training program and lifestyle modification can lead to a significant improvement in body weight, waist circumference and quality of life in obese women with PCOS [1].

**CONCLUSION:**

This study concluded that aerobic training along with lifestyle modification improves obesity indices (body weight and waist circumference) in women with PCOS. Also, there is improvement in the quality of life.

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