

The effect of 12 weeks aerobic exercise on DHEAso4, 17OH-Progestron concentrations, number of follicles and menstrual condition of women with PCOS

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Original Article

Abstract

Introduction: The effective method of treatment of Polycystic Ovary Syndrome (PCOS) is lifestyle modification. The aim of this study was to evaluate the effect of 12 weeks aerobic exercise on DHEAso4, 17OH-Progestron Concentrations, number of follicles and menstrual condition of women with PCOS.

Methods: In this clinical trial, 40 PCOS patients lean (BMI < 20) and obese (BMI > 25) randomly divided into two trained and sedentary control groups. DHEAso4, 17OH-Progestron Concentrations, number of follicles and menstrual condition were measured before and after the program (12-week exercise training program, aerobic exercise at 60-80% of maximal heart rate, 25-30 min/day, 3 days/week).

Results: Decline of DHEAso4, 17OH-Progestron Concentrations were significant after exercise in obese group (P=0.023, P<0.0001). The number of follicles right and left ovaries decreased significantly after exercise in two groups lean and obese (Right; P=0.019, P=0.041 and Left ovary; P=0.005, P=0.008). Menstrual situation was improved after exercise in obese and lean groups (P=0.028, P<0.0001). The body weight decreased significantly after exercise in obese groups (P<0.0001).

Conclusion: It seems that a term of exercise with weight loss can induce decline of DHEAso4 and 17OH-Progestron. In addition, exercise lead to improved menstrual condition and reduction of number of ovarian follicles per groups of lean and obese.

Key words: Exercise – Follicles - Menstrual

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Introduction:

Polycystic Ovary Syndrome (PCOS) is the most prevalent Endocrinologic disease and ovarian disorder influencing 8-12% of them (1). The disease characterizes over secretion of ovary

anderogens and heterogeneous spectrum of symptoms like Hirsutism, Oligomenorrhea or Amenorrhea, lack of ovulation and even infertility (2). PCOS affects not only obese women but also thin women and it is characterized by clinical and biochemical markers like high anderogens,

Hirsutism, menses disturbance and Polycystic ovaries (3). The developing studies show that PCOS has central obesity, insulin resistance and hyperinsulinemia (4). The resistance to insulin and obesity expose the women with PCOS to higher risk of type 2 diabetes, dyslipidemia, cardiovascular disease and increasing blood pressure (5).

Increasing adrenal and ovarian androgens synthesis and decreasing SHBG (sex hormone binding globin) by liver, insulin leads to increase the amount of serum free androgens and prevention from appropriate growth of ovary follicles (5). Different researches indicate sport activity affects decreasing of insulin (6-8).

Furthermore, Qiu et.al, after a sport activity period in PCOS (rats), reported that decreasing amount of serum insulin influenced by sport activity can improve hyper androgenism (9).

However, based on suggestion of some studies, the susceptibility to hyperinsulinemia, drug intervention like taking metformin, is prescribed, but it has side-effects like gastrointestinal disorders (vomiting, diarrhea) that should not be ignored (10). In this field, prescribing metformin has not been confirmed by food and drug administration (FDA) (10). Also Teede et al (2010) reported that using anti-pregnancy pills to treat women with PCOS can be proper. But will have undesirable effects on metabolic and cardiovascular system in long term (11).

With this reason, some researchers considered changing the life style relying on sport activity and lowering body weight as the most preferable and effective method to treat the women with PCOS (12).

In spite of enough evidence indicating positive effectiveness of sport activity improving sensitivity to insulin, decreasing metabolic and cardiovascular risks among different human populations, effectiveness of the intervention to improve metabolic and hormonal disorders in individuals with polycystic ovaries syndrome specially in separated obese and thin groups were studied less. Recently, in this respect, Harrison, et al (2011) showed that regarding to decreasing risks and improving the patients with type 2 diabetes, there is the probability that this method

can be useful to treat and improve women with PCOS.

After a three-month study about aerobic sport activity Vigurito et.al (2007) reported significant decrease in body weight and lack of change in quantities of 17- β progesterone and Androstenedione for women with PCOS (14).

Elftheriadou et al (2012) with a comprehensive study reported that the patient with PCOS participate in sport activity less than healthy group in the same age and most of them are not aware of fruitful effects of sport activities in PCOS treatment and prevention (15).

In recent years several studies reported ideal changes for cardiovascular and metabolic issues in these patients (7,8,13).

So, performed surveys in the field has barely engaged in the study of hormonal changes in PCOS women. So, the necessity of administration and presentation for enlarged investigations studying about hormonal and metabolic changes in obese and thin patients separately is seen more than past. So the goal of the survey is to study effectiveness of aerobic sport activity within 12 weeks or androstone sulfate, 17-OH progesterone, the number of follicles and menstrual position in PCOS women.

Methods:

This clinical trial study was performed in 2011, 40 PCOS women (aged 23.55 ± 5.03 , weight 49.78 ± 2.91 (thin) and 81.18 ± 13.8 (fat) Kg, length 160.75 ± 5.65 cm and body mass index (BMI) 18.86 (thin) and 32.03 (fat) kg/m^2 , referring to clinic of obstetric hospital in Bandar Abbas were selected randomly. After diagnosis and clinical treatment by respective specialists and completing a questionnaire consisting of personal information, medical-sport history was completed. Informed consent was obtained from each patient. They were selected based on body mass index (BMI) in two groups, thin $\text{BMI} < 20$, fat $\text{BMI} > 25$, and then every group was divided in experimental and control group randomly. Aerobic sport activity (running) for 12 weeks and 3 sessions weekly during 25-30 min. 60-85% intensity for maximum heart beat regarding overload theory duration was 25 min in the first 4

weeks and 30 min since the fifth week and sport activity intensity 5% every 2 weeks.

The mentioned program was performed by presence of researchers and 2 co-workers.

The entrance conditions to study included as: age mean 16-40, body mass index less than 20 and more than 25, having at least 2 cases of symptoms, polycystic ovaries, lack of ovulation or oligomenorrhea, hirsutism (higher than 8 based on ferrim an-Gallwey ranking system), clinical and biochemical symptoms of hyperandrogenism, LH/FSH > 2. The patient under medical treatment for menstrual disorders, consuming anti-seizure drugs, preventing the pregnancy or getting-slim medicines and individuals with hepatitis, cardiopulmonary diabetes, pregnancy, hypo and hyperthyroid, abnormal cases of TSH, Cushing's syndrome, androgen secretory tumor, Adrenal hyperplasia were excluded from the study.

Blood specimens of all people were collected before and after intervention (sport activity in 12 weeks) in a reference laboratory by lab personnel at 8 a.m. After at least 8 hours of breakfast during the first days of proliferation stage (the second and fourth days of menses). The rate of DHEASO₄ in method chemiluminescence using American Italian, liaison, kits and the rate of 17OH-progesterone in method Eliza using Germany IVI Kit are measured.

The collected data are analyzed by using SPSS software and paired t-test to compare the mean before and after intervention, independent t-test to

compare the mean of experimental and control groups, Mc-Nemar and Chi-Square tests were used for statistical analysis and P < 0.05 was considered statistical significant.

Results:

According to the findings, decreasing DHEASO₄ and 17OH-progesterone was statistically significant in only experimental group of obese women (P < 0.0001 and P = 0.023) (Table 1).

The amount of DHEASO₄ had a significant decrease after sport activity in experimental group to thin women control group (P = 0.002) (Table 2).

The number of follicles existing in right and left ovaries had significant decrease in experimental group of both obese and thin women (right ovary; P = 0.041 and left one; P = 0.005, P = 0.008) (Table 1 and 2).

The body weight decreased significantly in experimental group of fat women (P < 0.0001). Therefore, this variable has increased significantly in control group of obese and thin women (P = 0.01, P = 0.04). More over, this variable decreased significantly in experimental group of thin women compared to control group (P = 0.006) (Table 1 and 2).

Menstrual condition (menses cycle) in obese and thin women has improved after sport activity (P < 0.0001, P = 0.028) (Table 1 and 2).

Table 1. Comparison between the mean and SD in obese women with PCOS before and after 12 weeks exercise

BMI > 25 Obese	Control		Experimental	
	Before	After	Before	After
Weight	81.75 ± 18.5	82.7 ± 18.3*	80.6 ± 9.2	77.4 ± 9.4*†
17OH-Progesterone (ng/ml)	1.31 ± 0.39	1.25 ± 0.36	1.53 ± 0.86	1.09 ± 0.75*
DHEASO ₄ (ug/dl)	349.4 ± 113.3	330.3 ± 98.5	284.7 ± 101.3	240.5 ± 70.1*
Follicles Number in Left Ovary	17 ± 5	18 ± 3	17 ± 2	12 ± 2*
Follicles Number in Right Ovary	18 ± 4	18 ± 3	16 ± 4	13 ± 2*
Menstrual Condition ¹	10	7	10	4*

†: Significant Difference with Control Group

¹: The Individuals with oligomenorrhea

*: Significant Difference with Before Exercise

Table 2. Comparison the Mean and SD in Lean Women Before and After 12 Weeks Exercise

BMI < 20 Lean	Control		Experimental	
	Before	After	Before	After
Weight	50.6±1.2	52±1.53	48.95±4.5	48.8±4.2
17OH-Progesteron (ng/ml)	1.36±0.47	1.4±0.4	0.93±0.42	0.78±0.17
DHEAso4 (ug/dl)	378.9±194.3	364.7±143.6	312±1134.6	233.1±41.5†
Follicles Number in Right Ovary	16±3	17±3	15±3	11±2*
Follicles Number in Left Ovary	18±1	16±3	16±1	11±2*
Menstrual Condition ¹	10	10	10	2*†

*: Significant Difference with Befor Exercise

1: The Individuals with oligomenorrhea

† : Significant Difference with Control Group.

Conclusion:

The sport activity impact on the improvement of many diseases such as metabolic and cardiovascular diseases. However, Sport activity impact on polycystic ovary syndrome has not been analyzed a lot and a few related studies indicate positive and constructive effects. Moran et al (2009) reported that life style including regular sport activity is the first priority to treat most PCOS women (16). So, the recent study aims at studying effectiveness of aerobic sport activity on Hydro-Androsteron Sulfat, 17-β progesteron and the number of follicles and menses condition of PCOS women.

The results in recent study showed that the amount of dihydroepi andrestation sulfate, 17- β progesterone and body weight in obese women has decreased significantly after sport activity (It Seems it be one of the mechanisms to decline quantities of these two hormones in relation to reducing weight and central fatness amount). Whereas vigorous, et.al (2007) and palemba et.al (2010) did not observe the meaningful changes in the amount of dihydroepi andrestation sulfate in sport activity after 3 months and 6 weeks respectively (17,14). In the study done by pal moa et.al (2010), decreasing body weight was not remarkable and also sport activity duration in their study has been half of the current study described as the reason for incorrespondence of results in two studies. Also palmo, et.al believed that no change this hormone is due to the lack of decreasing changes in body weight (17). In addition, in the study done by vigorigu et.al, BMI

of studied women has been 28, while fat woman in this study were 32. In one of the most recent study, Hutchison et.al (2012) observed lack of changing in androgens amounts in health and PCOS women after sport activity in 12 weeks. In the other hand, in this study, no change has seen in the amounts of dihydroepi andrestation sulfate and 17- β progesteron and body weight in thin women in 12 weeks. This is a confirmation to the hypothesis that changing dihydroepi andrestation sulfate and 17-B progesterone in PCOS corresponds with changing body weight arising from sport activity. In the study done by victorin, et.al (2009), decreasing the amount of DHEA was not meaningful in PCOS women with BMI 26.8±4.8 after sport activity in 16 weeks (18). It seems sport activity can significantly lower hormone amount in fat women (BMI > 30), but it has not much effect on the thin women, however, it can prevent from increasing body weight and unpleasant effects relating Hyper androgenism. Furthermore, several studies have shown that losing weight 5-10% in obese women with overweight suffering from PCOS can lead to decreasing plasma insulin, hyper androgenism, biochemical, clinical symptoms in hyper androgenism (19,20), improving menstrual cycle (21,22), fertility and risky factors for cardiovascular and metabolic disease (19). So, there are observations indicating independence of sport activity from body weight decrease can cause an improvement in heart, metabolic condition, insulin resistance, a decline in central fatness and improvement in clinical and hormonal condition in PCOS women (23). In other side,

sport activity with positive Impact on neuropeptides can indirectly improve the state of the patients with polycystic ovaries syndrome.

An increase in leptin amounts is shown in PCOS women and it is said that leptin prevents insulin from attaching to fat cells (24) and weakens insulin activity in liver cells (25) and plays an important role in obesity pathogenesis dependent on insulin and probably disorder in ovulation in PCOS (26). In addition, Caminos et al (2008) reported that in vitro conditions, adiponectin-hormone opposing insulin resistance secreted from fat cells tackles secretion of testosterone (27) and has an important role in raising sensitivity to insulin and androgens (27). In a study done by Wang et al (2010), a decline in adiponectin quantities in PCOS women is seen (28). Different studies have shown that the long sport activity can cause a rise in adiponectin amounts and a decline in leptin amount (29,30).

Therefore, Probably increasing adiponectin quantities and decreasing leptin quantities resulting from sport activity is the other one of the mechanisms for decreasing androgen quantities and improving insulin sensitivity following sport activity.

Another result in recent study has been lowered the number of follicles existing in left and right ovaries in both groups, thin women (decrease 4 and 5 units) and obese ones (decrease 3 and 5 units).

There's no survey based on sport activity effect on follicle changes in PCOS women. So, Corosegnani et al observed a decline in ovarian follicles after a dietary period with limited calorie reception and a little weight loss (2). Also, a decrease in ovary follicles after taking anti-pregnancy pills was reported (31). Based on Rotterdam agreement, the existence of 12 follicles or more in each ovary is one of the criteria diagnosing PCOS. In these patients, abundant amount of LH in blood causes a rise in androgens production and then hindered the selection of predominate follicles, destruction and atrophy of follicles and lastly lack of ovulation (22). The steps leading to morphology change in ovaries is probably concerned with decreasing, androgen (22). In a recent study, decreasing LH quantities after sport activity is seen in both obese and thin

groups. Also it is said that the decrease in the number of follicles can be relevant to decrease of androstandim (22). Also it is reported that changing lifestyle in PCOS women with weight loss and fat bellies leads to improve hormonal condition and renewal of ovarian function (21, 32).

Another result of the recent study is to improve menstrual condition in 80% of thin women present in experimental group and 60% of obese women in experimental group which is in harmony with other results in this field ((7,13,14,19). Harrison, et.al (2011) have shown that aerobic, resistant sport activity or a combination of those can lead to losing weight, insulin sensitivity improvement, ovulation, and menstrual condition in women with this syndrome (13).

According to this report, insulin resistance and insulin enhancement and its activity on ovary tissue lead to disorder in adjustment of ovarian hormone, menstrual cycle, ovulation and finally infertility (33) and by direct effect on Thecal cells leads to arouse androgens production and to raise hyper androgenism symptoms like acne and hirsutism (34). Therefore, sport activity via reducing weight, decreasing insulin amounts, improving insulin sensitivity and lipidemia, hormonal and neuro peptides can cause improvement in menstrual condition, ovarian function in obese and thin women specially fat women suffering from PCO ovarian syndrome. Lack of control of diet in studied individuals is one of the research limitations. However, the studied individuals agreed to avoid over consumption of sweets and fatty foods, but because they were out of control, judgment about performance and their administration method is impossible.

Totally, findings of the current study showed that sport activity over a period causes a meaning fully weight loss, DHEASO₄ and 17 OH-progesterone amounts in only fat women suffer with PCOS. Therefore, improving ovarian function (decreasing follicles) and menstrual cycle is seen in both obese and thin women groups after sport activity.

So, regarding to positive impacts of sport activity on hormonal condition and women body structure with PCOS, it is suggested that a regular, collective program be inserted in treatment

program for these patients. So, it needs future studies to study sport activity impacts in combination with diet on changes of PCO ovarian syndrome.

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