Iraqi Journal of Biotechnology, May 2018, Vol. 17, No. 1, 98-105

Effect of physical activity on sex hormones in polycystic ovary syndrome Iraqi women

Mothanna A.S. Al-Mahdawi[1] , Hussein K. Khadhem[2] , Sarah R.H Al- Jebori[1]

[1]Biology Dpt., College of Science - Diyala University .
[2]AL- Infertility Dpt., Batool Teaching Hospital.

Received: January 21, 2018 / **Accepted**: March 20, 2018

Abstract: The study include 50 subject in period (20/12/2016- 28/3/2017) of iraqi women in Diyala governorate (18-25 years), 40 subject with Polycystic ovary syndrome (PCOs) 20 with physical activity who practice sport for 2 hours in day and 20 with no physical activity) and 10 subject control. The study showed no significant difference of the age(>20, ≤20) and body mass index of PCOs and control, but there were highly significant of sex hormones (LH, Prolactin, Testesteron) in PCOs compared with control, results showed no significant difference in the age, body mass index with physical activity and PCOs, and a highly significant effect of the physical activity on sex hormones (LH, Prolactin, Testestosterone) in the physical activity PCOs women compared with no physical activity PCOs women. This study showed that physical activity improves levels of hormones (LH, Prolactine, and Testosterone) in PCOs Diyala women.

Key Word: polycystic ovary syndrome, Lutinizing, Prolactine, Testosterone, Physical activity.

Corresponding author: should be addressed (Email: sararashid495@gmail.com).

Introduction:

Polycystic ovary syndrome (PCOS) is a complex heterogeneous endocrine disorder. It is a common disorder affecting 4-12% of women of reproductive age (1, 2). PCOS was first described in the United States in 1935(3). PCOS is characterized by chronic anovulation and hyperandrogenism in the absence of underlying adrenal or pituitary disease. Women with PCOS may complain about variable clinical manifestations including oligomenorrhea, hirsutism, acne, and infertility (4, 5, 6). Approximately 75% of these women suffer from infertility due to anovulation. Therefore, it is the most common cause of anovulatory infertility (7,8). PCOS is also reported to be associated with obesity, insulin resistance and type II diabetes, dyslipidemia, hypertension, cardiovascular disease and endometrial carcinoma (9,10,11). Approximately 50-60% of women with the syndrome are overweight or obese compared to 30% of women in the general Mpopulation (5,6,12,13) Treatment of PCOS must focus both on normalizing short-term signs of hyperandrogenism and anovulation and on reducing metabolic complications. This can be achieved through pharmacological intervention or preferably lifestyle modification (14). The most preferred and effective method of treatment of PCOS is lifestyle

modification. Weight loss is an important treatment strategy. Weight loss improves practically every parameter of PCOS. In obese, anovulatory PCOS women, weight loss restores ovulation and pregnancy rates, decreases insulin levels, diminishes acanthosis nigricans, lowers testosterone levels while raising sex hormone binding globulin (SHBG) levels, and improves psychological considerations (15,16). Lifestyle regulation by diet or exercise is beneficial for women with polycystic ovary syndrome, especially women who suffer from weight gain or obesity by improving the sensitivity of skeletal muscle muscles to insulin (17). Clinical and biochemical symptoms are affected by diet and exercise (18). Therefore this study aimed to investigate the correlation between physical activity and concentration sex hormones in PCOs women in Diyala governorate.

Materails and Methods:

Collection of Specimens:

The study include 40 subject with PCOS (20 with physical activity who practise sport for 2 hours in day and 20with no physical activity) and 10 subject control in Batool teacging hospital for period (20/12/2016-28/3/2017) aged (18-25) years divided in to (>20, ≤20), all this patients and control were subjected to Ultra-sonography for diagnosis of both ovaries.

Hormonal assay:

Venous blood sample (5 ml) was collected from both PCOS and healthy control. The serum obtained by putting the blood samples in a plastic tube and allowed to clot at 37C for 30 minutes before centrifugation. The tubes centrifuged at 5000 rpm for 5 minutes. Hormonal tests were performed by using Addendum-Mini VIDAS apparatus (VIDAS) 12 mode l0, BioMerieux Company, through an enzyme linked fluorescent assay (ELFA) technique. All the assay steps are performed automatically by the instrument. The assay will be completed within approximately 60 minutes. The values of hormonal assays for the subjects were compared with the next normal range, LH =1.5- 8 μ IU/ml, FSH = 3.9-12μ IU/ml, Prolactine ≤ 23 ng/ml and Testosterone = 0.1- 0.9 ng/ml.

Body Mass Index:

The female body mass index (BMI) was measured according to the following equation: dividing the weight in kilograms by the height in squared meters (kg/m2) (19)**.** The parameter of BMI: Underweight ≥ 18.5, Normal 18.5-24.9, Overweight 25-29.9 and Obesity ≤ 30 (20)

Statistical Analysis:

The data of the current study were analyzed using the Student T-test in Excel where the mean, standard deviation (SD), standard error (SE) and arithmetic mean were extracted.

Results and Discussions:

Results show no significant difference in the age of PCOS women compared with control (table 1).

Table (1): correlation the age of women with PCOS

			Groups		Total
			Patients	Control	
Age	<20 Year	N	19	4	23
		%	47.5%	40.0%	46.0%
	≥20 Year	N	21	6	27
		%	52.5%	60.0%	54.0%
Total			40	10	50
X^2			0.181		
Sig.			**0.67^{NS}**		

NS: Non-significance

This result is Consistent with other studies (21,22,23). This is an indication that age has no relationship with PCOs.

There were no significant differences in body mass index (BMI) in PCOs women compared with control group, as shown in Table (2).

Table (2): Relationship of age and body mass index with Pcos women

	Groups	No.	Mean	Std. Deviation	Std. Error	T	Sig.
Age	Patients	40	20.48	2.51	0.40	0.2	0.83^{NS}
	Control	10	20.30	1.64	0.52		
BMI	Patients	40	24.50	2.67	0.88	1.43	0.31^{NS}
	Control	10	27.41	3.77	0.99		

This indicates that weight is not considered as a manifestation of the symptoms of PCOS. Because this study focus on age rimmed (18-25 year) Therefore, the level of obesity in adolescents with the syndrome should not be expected to be similar to that of adults with the same syndrome (24).

Hormonal results show significant difference of concentration LH, Prolactine, Testosterone hormone in PCOS women was (7.06mIu/ml, 19.09ng/ml, 0.64 mIu/m) compared to control (5.24mIu/ml, 14.87 miu/ml, 0.46mIu/m) Respectively, figure (1).

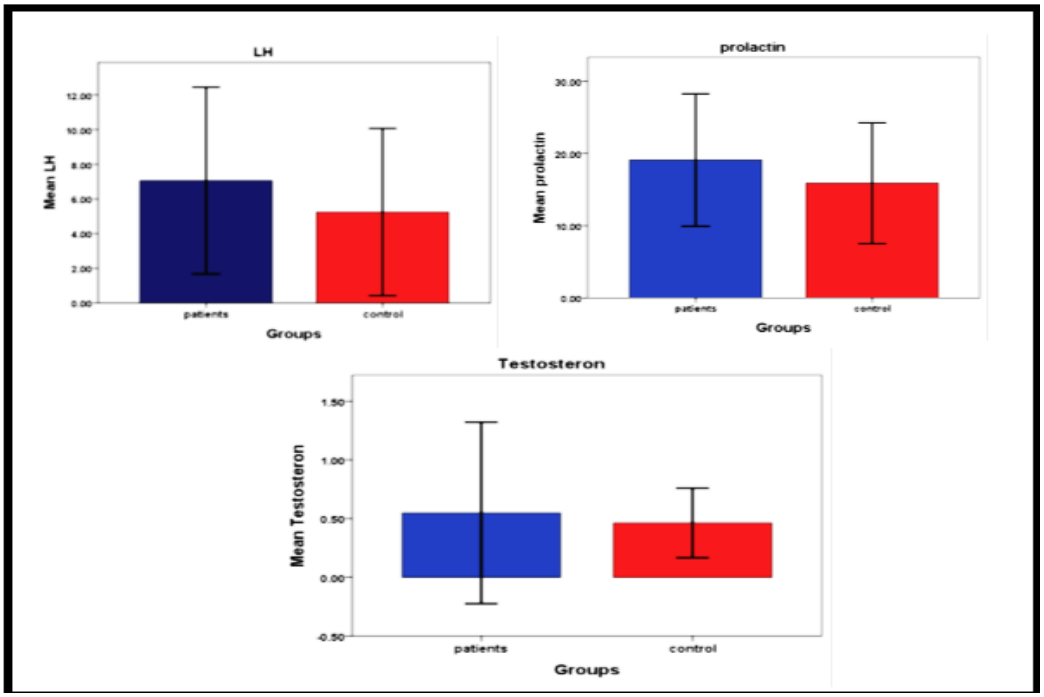

Figure (1): Concentration of LH, Prolactine, Testosterone hormone in PCOs women

The study show significant difference in the levels of LH in PCOs (M=7.6mIU/ml) patients compared to control (M=5.24mIU/ml) that agreed with the previous studies (25,26) which shows that (60-70) % of patients with PCOS had an increase in their LH level. This increase may be due to increase of pulse frequency, or episodic secretion of LH (27).

There was no significant difference in FSH hormone levels reported in this study between PCOS and control. This result was in agreement with a study done by Salehpour *et al* (23).

Serum prolactin is a significantly elevated in PCOS patients (M=19.09 ng/ml) compared to the control (M=15.87 ng/ml) Hyperprolctinemia associated luteal phase dysfunction may reflect the suppressive effect of in appropriately elevated prolactin, since high level of prolactin completely blocks binding of FSH to FSH receptor on granulosa cell leading to the suppression of progesterone production (28).

There is a significantly elevated level of testosterone in PCOs (M=0.64 ng/ml) patients compared to control (M=0.46ng/ml), the results in this study agree with other study (27). This can be explained by the fact that insulin has also an inhibitory effect on hepatic production of SHBG resulting in increment of free testosterone in addition to its stimulatory effect to the ovarian androgen production amplifying the state of hyperandrogenism (29).

In order to investigate the relationship between physical activity and the age of PCOs women, the results showed high significant differences, most of the patients with physical activity were less than 20 years (70%) compared with patients with no physical activity within the same age group (25%), as showed in table (3).

Table (3): Relationship between physical activity and the age of PCOs

			Groups		Total
			Non Pysical activity	Pysical activity	
Age	<20 Year	No.	5	14	19
		%	25.0%	70.0%	47.5%
	≥20 Year	No.	15	6	21
		%	75.0%	30.0%	52.5%
Total		No.	20	20	40
		%	100.0%	100.0%	100.0%
X^2		8.12			
Sig.		0.004**			

**** : Highly-significance**

The results of this study show a significant difference (P≤0.05) in the BMI of women PCOs with physical activity (Mean = 22.77kg /m^2) compared to women PCOs with no physical activity (Mean= 26.4077kg /m^2) as showed in table (4).

Table (4): Relationship between physical activity and the BMI and age of PCOs

Physical activity		No.	Mean	Std. Deviation	Std. Error Mean	T	Sig.
Age	Non Pysical activity	20	20.18	2.44	0.10	0.83	0.54^{NS}
	Pysical activity	20	19.30	3.47	0.11		
BMI	Non Pysical activity	20	26.40	3.50	1.79	1.56	0.03^{*}
	Pysical activity	20	22.77	2.23	2.18		

This was expected for the effect of exercise on the body mass index, increases BMI may be major factor of endocrine and metabolism disorder in PCOs women (30). Reported the obese and overweight PCOS women who had increase levels of T hormone and LH (30) there was high prevalence of overweight/obesity in PCOS women(33).

The results of effect the physical activity on regulation some sex hormone LH, Prolactin and Testosterone in PCOs women show significant differences between the two study groups, 9.08m Iu/m, 22.12 ng/ml, 0.30ng/ml than in PCOs women with no physical activity 5.05 mlu/ml, 16.08ng/ml, 0.80ng/ml and and this study show no significant in FSH level in both study groups, Table (5).

Table (5) Sex hormones in women PCOs with no physical activity compare to women PCOs with physical activity

	Non Physical activity N=20			Physical activity N=20				
Physical activity	Mean	S.D	S.E	Mean	S.D	S.E	T	Sig.
LH	9.08	6.93	1.55	5.05	1.79	0.40	2.15	0.01^{**}
FSH	5.89	2.36	0.53	6.12	1.49	0.33	-036	0.72^{N}
PRL	22.12	11.17	2.50	16.08	5.43	1.21	2.17	0.03^{*}
T	0.43	0.60	0.13	0.92	0.86	0.19	-2.14	0.03^{*}

Lifestyle may be active method treatment PCOs (34) Randeva *et al* stated that regular exercise, such as regular walking, reduces the waist to hip ratio and reduces of diabetes and cardiovascular risk in obese women with PCOs (35). Previous studies have shown that regular exercise improves metabolic and hormonal functions in women with PCOs (36, 37, 38). Other studies have shown that lifestyle modification improves the hormonal profile of women with PCOs who suffer from weight gain by decrease testosterone level, free androgen index, and increased globulin binding sex hormones after weight loss (39, 40). In the present study showed that the physical activity (practise sport) has positive correlation with some hormones regulate in PCOs women.

References:

1. Sheehan, M. T. (2004). Polycystic ovarian syndrome: diagnosis and management. Clinical Medicine and Research, 2(1): 13-27.
2. Azziz, R.; Woods, K. S.; Reyna, R.; Key, T. J.; Knochenhauer, E. S. and Yildiz, B. O. (2004). The prevalence and features of the polycystic ovary syndrome in an unselected population. The Journal of Clinical Endocrinology and Metabolism, 89(6): 2745-2749.
3. Stein, I. F. and Leventhal, M.L. (1935). Amenorrhea associated with bilateral polycystic ovaries. American Journal of Obstetrics and Gynecology, 29(2): 181-191.

4. Ehrmann, D. A. (2005). Polycystic ovary syndrome. New England Journal of Medicine, 352(12): 1223-1236.

5. AL-Faisal A.H.M. and Mahdi Saber G. Al-Deresawi. 2012. The correlation between thyroid hormones, reproductive hormones, body mass index (BMI) and hirsute in Iraqi women with polycystic ovary syndrome (PCOS). Anbar University,The Second Scientific Conference for Pure Science.22-24 November.

6. AL-Faisal, A.H.M. and Tabark Sabah Al – Rubiay (2014). Association of body mass index (BMI) and reproductive hormones with polycystic ovary syndrome in Iraqi patients. Int.J.Advance Res.,2(11): 788-791.

7. Adams, J.; Polson, D. W. and Franks, S. (1986). Prevalence of polycystic ovaries in women with anovulation and idiopathic hirsutism. Journal of Br. Med (Clin Res Ed), 293(6543): 355-359.

8. Hull, M. G. R. (1987). Epidemiology of infertility and polycystic ovarian disease: endocrinological and demographic studies. Gynecological Endocrinology, 1(3): 235-245.

9. Carmina, E., and Lobo, R. A. (1999). Polycystic ovary syndrome (PCOS): arguably the most common endocrinopathy is associated with significant morbidity in women. The Journal of Clinical Endocrinology and Metabolism, 84(6): 1897-1899.

10. Dahlgren, E.; Janson, P. O.; Johansson, S.; Lapidus, L. and Oden, A. (1992). Polycystic ovary syndrome and risk for myocardial infarction: evaluated from a risk factor model based on a prospective population study of women. Acta. obstetricia gynecologica Scandinavica, 71(8): 599-604.

11. Dunaif, A.; Segal, K. R.; Futterweit, W. and Dobrjansky, A. (1989). Profound peripheral insulin resistance, independent of obesity, in polycystic ovary syndrome. Diabetes, 38(9): 1165-1174.

12. McKittrick, M. (2002). Diet and polycystic ovary syndrome. Nutrition today, 37(2): 63-69.

13. Flegal, K. M.; Carroll, M.D. and Ogden, C. L. (2002). Prevalence and trends in obesity among US adults, 1999-2000. J. A. M. A. 288:1772 -1773.

14. Norman, R.; Davies, M. and Lord, J. (2002). The role of lifestyle modification in polycystic ovary syndrome, TRENDS Endocrinol Metab. 13:251-7.

15. Clark, A. M.; Ledger, W.; Galletly, C.; Tomlinson, L.; Blaney, F.; Wang, X. and Norman, R. J. (1995). Weight loss results in significant improvement in pregnancy and ovulation rates in anovulatory obese women. Human Reproduction, 10(10): 2705-2712.

16. Apter, D. (1998). How possible is the prevention of polycystic ovary syndrome development in adolescent patients with early onset of hyperandrogenism. Journal of endocrinological investigation, 21(9): 613-617.

17. Kim, E. S.; Im, J. A.; Kim, K. C.; Park, J. H.; Suh, S. H.; Kang, E. S.; Kim, S. H.; Jekal, Y.; Lee, C.W.; Yoon, Y. J.; Lee, H. C. and Jeon, J.Y. (2007). Improved insulin sensitivity and adiponectin level after exercise training in obese Korean youth. Obesity (Silver Spring) 15: 3023-30.

18. Huber-Buchholz, M. M.; Carey, D. G. and Norman, R. J. (1999). Restoration of reproductive potential by lifestyle modification in obese polycystic ovary syndrome: role of insulin sensitivity and luteinizing hormone. J. Clin. Endocrinol Metab., 84: 1470–4.

19. Flegal, K. M.; Graubard, B. I.; Williamson, D. F., and Gail, M. H. (2005). Excess deaths associated with underweight, overweight, and obesity. Jama, 293(15): 1861-1867.

20. European Society of Human Reproduction and Embryology. (2009): Oxford Journals, Oxford University Press.

21. Al-khafaji, S. F. (2014). Serum anti-Mullerian hormone as a marker of polycystic ovary syndrome in Iraqi women. B.Sc thesis, Applied Chemical, Department Applied Sciences, University of Technology.

22. Kim, J. J.; Choi, Y.M.; Kang, J. H.; Hwang, K.R.; Chae, S. J.; Kim, S. M., and Moon, S.Y. (2013). Carotid intima-media thickness in mainly non-obese women with polycystic ovary syndrome and age-matched controls. Journal of Obstetrics and gynecology science, 56(4): 249-255.

23. Salehpour, S.; Tohidi, M.; Akhound, M. R. and Amirzargar, N. (2009). N acetyl cysteine, a novel remedy for poly cystic

ovarian syndrome. Journal of Fertility and Sterility, 2: 66-73.

24. Gambineri, A.; Pelusi, C.; Vicennati, V.; Pagotto, U. and Pasquali, R. (2002). Obesity and the polycystic ovary syndrome. International Journal of Obes. Relat. Metabolism Disorder, 26(7):883-896.

25. Katsikis, I.; Karkanaki, A.; Misichronis, G.; Delkos, D.; Kandaraki, E. A. and Panidis, D. (2011). Phenotypic expression, body mass index and insulin resistance in relation to LH levels in women with polycystic ovary syndrome. European Journal of Obstetrics and Gynecology and Reproductive Biology, 156(2): 181-185.

26. Begawy, A. F.; El-Mazny, A. N.; Abou-Salem, N. A. and El-Taweel, N. E. (2010). Anti-Müllerian hormone in polycystic ovary syndrome and normo-ovulatory women: Correlation with clinical, hormonal and ultrasonographic parameters. Middle East Fertility Society Journal, 15(4): 253-258.

27. Waldstreicher, J.; Santoro, N. F.; Hall, J. E.; Filicori, M. and Crowley, W. F. (1988). Hyperfunction of the hypothalamic-pituitary axis in women with polycystic ovarian disease: indirect evidence for partial gonadotroph desensitization. The Journal of Clinical Endocrinology and Metabolism, 66(1): 165-172.

28. Porter, M. B.; Brumsted, J. R. and Sites C K. (2000). Effect of prolactin on follicle stimulating hormone receptor binding and progesterone production in cultured porcine granulosa cell. Journal of Fertility and Sterility, 99-105.

29. Temel, I.; Celik, O.; HASÇALIK, Ş.; Celik, N.; Şahin, İ. and Aydin, S. (2010). Serum nonesterified fatty acids, ghrelin, and homocysteine levels in women with polycystic ovary syndrome. Turkish journal of medical sciences, 40(2): 221-228.

30. David, S. and Guzic k. (2004). Polycystic ovarian syndrome. Obest. Journal of Gyne, 103: 181-193.

31. Cupisti, S.; Kajaia, N.; Dittrich, R.; Duezenli, H.; Beckmann, M. W. and Mueller, A. (2008). Body mass index and ovarian function are associated with endocrine and metabolic abnormalities in women with hyperandrogenic syndrome. European journal of endocrinology, 158(5): 711-719.

32. Benson, S.; Janssen, O. E.; Hahn, S.; Tan, S.; Dietz, T.; Mann, K. and Elsenbruch, S. (2008). Obesity, depression, and chronic low-grade inflammation in women with polycystic ovary syndrome. Brain, behavior, and immunity, 22(2): 177-184.

33. Wang, J. X.; Davies, M. J. and Norman, R. J. (2001). Polycystic ovarian syndrome and the risk of spontaneous abortion following assisted reproductive technology treatment. Human Reproduction, 16(12): 2606-2609.

34. Balen, A. H.; Dresner, M.; Scott, E. M. and Drife, J. O. (2006). Should obese women with polycystic ovary syndrome receive treatment for infertility?: Given the risks such women will face in pregnancy, they should lose weight first. British Medical Journal, 332(7539): 434.

35. Randeva, H. S.; Lewandowski, K. C.; Drzewoski, J.; Brooke-Wavell, K.; O'callaghan, C.; Czupryniak, L. and Prelevic, G. M. (2002). Exercise decreases plasma total homocysteine in overweight young women with polycystic ovary syndrome. The Journal of Clinical Endocrinology and Metabolism, 87(10): 4496-4501.

36. Vigorito, C.; Giallauria, F.; Palomba, S.; Cascella, T.; Manguso, F.; Lucci, R.; De Lorenzo, A.; Tafuri, D.; Lombardi, G.; Colao, A. and Orio F. (2007). Beneficial Effects of a Three-Month Structured Exercise Training Program on Cardiopulmonary Functional Capacity in Young Women with Polycystic Ovary Syndrome. The Journal of Clinical Endocrinology and Metabolism 92(4):1379–1384.

37. Thomson, R. L.; Buckley, J. D.; Noakes, M.; Clifton, P. M.; Norman, R. J. and Brinkworth, G. D. (2008). The effect of a hypocaloric diet with and without exercise training on body composition, cardiometabolic risk profile, and reproductive function in overweight and obese women with polycystic ovary syndrome. The Journal of Clinical Endocrinology and Metabolism, 93(9): 3373-3380.

38. Bruner, B.; Chad, K., and Chizen, D. (2006). Effects of exercise and nutritional counseling in women with polycystic ovary syndrome. Journal of Applied

physiology, nutrition, and metabolism, 31(4): 384-391.

39. Moran, L. J.; Noakes, M.; Clifton, P. M.; Tomlinson, L. and Norman, R. J. (2003). Dietary composition in restoring reproductive and metabolic physiology in overweight women with polycystic ovary syndrome. The Journal of Clinical Endocrinology and Metabolism, 88(2): 812-819.

40. Jakubowicz, D. J. and Nestler, J. E. (1997). 17α-hydroxyprogesterone responses to leuprolide and serum androgens in obese women with and without polycystic ovary syndrome after dietary weight loss. The Journal of Clinical Endocrinology and Metabolism, 82(2): 556-560.