



## ROLE OF ULTRASOUND AND HORMONES IN THE STUDY OF POLYCYSTIC OVARIAN SYNDROME

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### **ABSTRACT**

**Objectives:** To study the role of ultrasound and hormones in diagnosis of polycystic ovarian syndrome (P.C.O.S) with correlation between hormone and clinical manifestations in P.C.O.S.

**Materials and Methods:** Sixty five women (18-32 years of age) with P.O.C.S based on menstrual history (amenorrhea or oligomenorrhea) and/or presence of hirsutism. All of them were subjected to vaginal ultrasound to confirm the presence of cystic change in the ovary (polycystic ovary). Blood sample was collected from each patient who was taken in the 2<sup>nd</sup> day of the cycle to measure their serum FSH, LH, testosterone, prolactine.

**Results:** The characteristics of women recruited in the present study showed 49.23% of them were 21-25 years old, 44.61% were over weight or obese (BMI > 25). The commonest second complaint was hirsutism 53.84%. Besides infertility, amenorrhea is prevalent in 98.47% and only minority of them (1.53%) has regular menses. This study shows high testosterone level (38.4%) in women with polycystic ovary in comparison with other hormones, FSH (9.2%), LH (3%) and prolactine (6.1%). The relationship between variables as assessed by correlation analysis revealed statistical significant correlation between testosterone level and cystic ovary diameter (in polycystic ovary) ( $p < 0.05$ ,  $r = 0.28$ ). No statistical correlation is found between hormone levels and BMI, menstrual pattern, hirsutism & amenorrhea.

**Conclusions:** A significant correlation is found between testosterone and cystic ovary size. In addition, there was a significant negative correlation between hormones & cystic ovary diameter. Furthermore, there was a significant positive correlation between hormone levels and ova size in women with polycystic ovarian syndrome. No significant statistical correlation is found between hormone levels and BMI, menstrual pattern and hirsutism.

**KEY WORD:** polycystic ovarian syndrome, testosterone, follicle stimulating hormone, Lutenising hormone, ultrasonography, hirsutism, body mass index.

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## INTRODUCTION

Polycystic ovarian syndrome (P.C.O.S) is a syndrome of oligomenorrhea, hirsutism and polycystic ovary with chronic unovulation and varying degrees of androgen excess. In ovulatory women, 75% have P.C.O.S<sup>(1)</sup>, though ultrasonography diagnosed cases may show normal hormone levels<sup>(2)</sup>. P.C.O.S is probably the most prevalent endocrinological disorder affecting women and it is the most common cause of menstrual disturbance during the reproductive age. It is characterized by the presence of polycystic ovaries on ultrasound together with clinical and biochemical signs of hyperandrogenism<sup>(3)</sup>. P.C.O.S is characterized by the presence of many minute cysts in the ovaries and excess pre syndrome can be found in an apparently normal woman and the full expression of the syndrome is very uncommon<sup>(4)</sup>. Adams et al<sup>(5)</sup> described that P.C.O.S has no constant manifestation apart from the criteria seen by vaginal ultrasound (10 or more cysts, 2-3 mm in diameter, arranged around an echo dense stroma) which appears to be the most sensitive diagnostic marker for P.C.O.S. The current diagnostic criteria for P.C.O.S defined during a consensus symposium held in Rotterdam, in May 2003, sponsored by the European Society of Human Reproduction and Embryology (ESHRE) and American Society for Reproductive Medicine (ASRM). Diagnosis depends on two of the following criteria only: Clinical and/or biochemical evidence of hyperandrogenism, with exclusion of other causes of androgen excess, oligo or unovulation and polycystic ovaries<sup>(6)</sup>. Moreover, manifestations of P.C.O.S may include menstrual irregularities, obesity, insulin resistance and elevated serum LH level<sup>(6)</sup>. The characteristic increase in LH relative to FSH release, have long been appreciated in P.C.O.S. Because of the pulsatile nature of their release, a single test fails to detect an increased LH/FSH ratio not included

in the diagnostic criteria for P.C.O.S<sup>(7)</sup>. Circulating estradiol is not like that in the follicular phase but estrone is elevated due to peripheral conversion and LH amplitude is increased more than its pulse and frequency<sup>(8)</sup>.

In this study we evaluated the role of ultrasound in diagnosis of polycystic ovarian syndrome in correlation with the hormone levels in the blood.

## MATERIALS AND METHODS

During the last two years, we have examined 65 patients who presented with one or more of the following symptoms (amenorrhea, oligopolymenorrhea, hirsutism, obesity, sterility). The patients were between 18-32 years of age. The endocrinal study consisted of blood level determination by Elisa methods of the following hormones taken in 2<sup>nd</sup> day of the cycle in patients who complained of amenorrhea and infertility: (1) determination of gonadotropin blood level LH (normal range in follicular phase was considered between 0.8-27.1 IU/L), (2) FSH blood level (normal range in follicular phase was considered between 2.2-15 IU/L), (3) total testosterone blood level (normal range in women was considered between 0.07-0.65 ng/ml) taken under basal conditions. (4) Prolactin level (normal range in women was considered between 2-27 ng/ml). All of the above normal values were based on reference standard values of the laboratory.

All women included had polycystic ovary as judged by vaginal ultrasound (6.5 MHz probe), finding of more than 8-10 follicles of diameter between 2 and 8 mm with ovarian size and volume exceeding 6.2 ml were taken to be diagnostic of P.C.O.S.

Body mass index (BMI) was measured, for each, using the following formula,  $\text{wt (kg)} / \text{ht (m}^2\text{)}$  measurements were scored to classify their state of obesity. Normal value of BMI is  $\leq 25$ .

## STATISTICAL ANALYSIS

All values are given as a mean  $\pm$  SD. The differences were assessed by paired or unpaired student's t-test.  $P < 0.05$  was considered to be statistically significant. Correlations between variables were computed by Microsoft Excel program, which run under windows software.

## RESULTS

A total number of 65 women with polycystic ovary were enrolled in this study. The characteristic of women included in this study concerning their age, BMI, hirsutism and menstrual status are shown in Table 1

Table 2 shows that all hormone levels in patients with P.C.O.S were within normal values except

testosterone level which was found to be higher (by 39%) over that of normal reference range. In addition, BMI in women with polycystic ovarian syndrome ( $28.07 \pm 1.2$ ) was higher than normal reference value of  $\leq 25$ .

Out of the 65 cases with P.C.O.S, 36 (53.84%) had hirsutism, 64 (98.4%) had amenorrhea while those regular menses are minority of only 1 (1.5%).

This study shows that 25 (38.4%) women with polycystic ovarian syndrome have high testosterone level in comparison with other hormones, as a high level of FSH was found in 6 (9.2%) women, high prolactine level was found in 4 (6.1%) women, and a high level of LH was found in 2 (3%) women.

To confirm the possible role of hormones in the pathogenesis of P.C.O.S, figure 1 showed a positive

TABLE (1) Characteristic of the sample distributed by Age, BMI, hirsutism and menstrual pattern (n = 65).

Parameters	Age Range (years)	Number of women	%
Age	16-20	12	18.46%
	21-25	32	49.23%
	26-32	21	32.30%
BMI	16-25	15	23.07%
	25.1-30	29	44.61%
	30.1-35	18	27.69%
	>35	3	4.61%
Hirsutism	Positive	35	53.84%
	Negative	30	46.16%
Menses	Regular	1	1.53%
	Amenorrhea	64	98.47%

TABLE (2) Hormonal status, BMI, in polycystic ovarian syndrome female individuals (n=65).

	Age (years)	Weight (Kg)	BMI (kg/m <sup>2</sup> )	LH IU/L	FSH IU/L	Testosteron ml/L	prolactin ng/L
Mean	24.3 $\pm$ 3.6	71.2 $\pm$ 12.4	28.07 $\pm$ 1.20	9.3 $\pm$ 7.4	7.4 $\pm$ 5.0	0.9 $\pm$ 0.7	9.4 $\pm$ 8.2
Range	18-32	47-95	18-41	1.8 $\pm$ 43.6	2.1 $\pm$ 13.2	0.2 $\pm$ 4.1	1.2 $\pm$ 44.7

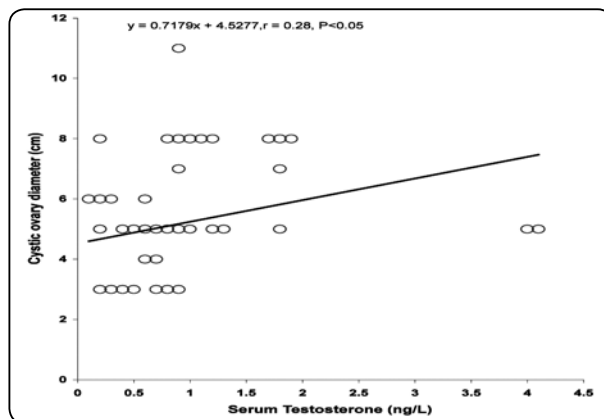


Fig. (1) Correlation between testosterone level and cystic ovary diameter,  $n = 65$ .

and a significant correlation between testosterone level and cystic ovary diameter. This indicates that a high level of testosterone may increase the possibility of P.C.O.S.

Sonography allowed the diagnosis of P.C.O.S in all patients with marked enlargement of ovaries with bilateral micro cystic finding more than 8-10 in number of diameter between 2 and 8 mm (IFig 2) .

## DISCUSSION

Although P.C.O.S is a relatively common disorder with 5-10% prevalence among women of reproductive age, its etiology remains unknown <sup>(7)</sup>. It is emphasized that, P.C.O.S is a syndrome with no significantly single diagnostic criterion sufficient for clinical diagnosis <sup>(6)</sup>. In this study the basic finding on which diagnosis of P.C.O.S was made is the presence of polycystic ovary by vaginal ultrasound plus the suggestive clinical findings of amenorrhea and /or hirsutism, fulfilling the Rotterdam updated criteria of P.C.O.S <sup>(6)</sup>. In the present study of the 65 women, 64 of them had amenorrhea (complete loss of cycle pattern and bleeding always unexpected) and one of them still have regular menses in spite of evident hirsutism. P.C.O.S is reported to be more prevalent in younger age ( $< 35$ ) than among older women <sup>(9)</sup>. This is in agreement with current find-



Fig. (2) Polycystic ovary by endovaginal ultrasound

ings in which about 96.9% of the patients included in the present study were less than 32 years of age. Regarding BMI, 50% of participants were overweight ( $\text{BMI} \geq 25 \text{ kg/m}^2$ ). This result is in complete agreement with those data reported by Pasquali et al <sup>(10)</sup> and kiddy et al <sup>(11)</sup>, who found that about 50% and 35% of women with P.S.O.S are obese or overweight respectively. The traditional belief that the obesity plays a serious role in the pathophysiology of P.C.O.S dated back to years of stein Leventhal but the puzzling fact that not all P.C.O.S women are obese

Hirsutism was the second common criteria of P.C.O.S that claimed to suffer. It is prevalent in 53.84% of them. This result is relatively close to the figure 64.49% obtained by Alnakash et al <sup>(16)</sup>. Abnormality of the hypothalamic-pituitary ovarian or adrenal axis has been implicated in P.C.O.S. This may be suggested indirectly by the finding of a significant association between testosterone level and cystic ovary diameter in P.C.O.S.

As far as the literatures are concerned, endocrine studies alone, in the majority of cases, do not provide any single laboratory test which can lead to definite diagnosis of PCOS (15). In this study, ultrasound examination proved to be extremely useful in diagnosis of P.C.O.S in patients with of

chronic unovulation with enlarged ovaries and the presence of multiple cysts more than 10 in number with diameter of 2-8 mm whose clinical findings are amenorrhea or oligomenorrhea and or /hirsutism. Takahashi et al <sup>(16)</sup> reported that, an ovarian volume of > 6.2 ml and follicles of > 10 in number with diameter of 2-8 mm are transvaginal ultrasound criteria of P.C.O.S. These criteria were seen in 94% of those women recruited in the present study. Since determination of bilaterally enlarged ovaries is essential for correct diagnosis of P.C.O.S, the use of an imaging technique is of basic importance. Further more, while gynecography provides a good description of the external ovarian outline, it gives no information concerning the internal structure of the organ. Luigi et al <sup>(15)</sup> reported that ultrasound examination proved to be extremely useful in the preoperative diagnosis of P.C.O.S.

## REFERENCES

1. Bhattacharya Dipankar, Mandal Kumar, Mukherjee Satinath, Pradhan Mamata: Journal of obstetrics and Gynecology of India Vol,55,No.1:-January/February 2005.
2. Frankss: Polycystic ovary syndrome .NE ngl Med 333:853-16,1995.
3. Ovesen PG, Moller, N and Greisen. S.polycystic ovary syndrome,clinical presentation and treatment.Ugesker-Laeger 1998 Jan 12;160(3):260-4.
4. Marcus, Polycystic ovarian syndrome.ivf-infertility .com, 2010 Feb,Vol 14;9-53.
5. Adams J, Franks and polson DW.Multifollicular ovaries: clinical and endocrine feature and response to pulsatile gonadotrophin releasing hormone.Lancet ii 1985;1375-8.
6. Rotterdam ESHRE/ ASRM.sponsored P.C.O.S consensus work shop Group Revised 2003 consensus on diagnostic criteria and long term health risk related to polycystic ovary syndrome Fertil Steril 2004; 81:19-25.
7. Dunaif A.Insulin Resistance and the polycystic ovary syndrome.Endocrine Reviews 1997;18 (6) 774-800.
8. Imse V, Holzapfel G, Hinney V et al. Comparison of LH pulsatility in serum of women suffering from PCOS using a bioassay anf five different immunoassays. J Clin Endocrinol Metabol 1992;74:1053-61.
9. Ritta k.Endocrine and metabolic changes in women with polycystic ovaries and polycystic ovary syndrome.A dissertation submitted to department of obstetrics and gynecology, faculty of medicine,university of Oulu Finland 2001.
10. Pasquali-R, Vicennate V: Influence of weight and distribution of adipose tissue in functional hyperandrogenism. Contracept-Fertil-Sex. 1998 May;26 (5):372-5.
11. Kiddy tween obese DS, Sharpps and white DM.Difference in clinical and endocrine features,between obese and non obese subjects with polycystic ovary syndrome and analysis of 263 can secutive cases. Clin Endocrinal Oxf 1990 Feb,32(2)213-20.
12. Yenss: The polycystic ovary syndrome clin-Endocrinol. 1980;12:177-183.
13. Insler V, shoham Z and Barash A polycystic ovaries in non obese and obese patients possible pathophysiological mechanism based on new interpretation of facts and findings.Human Reproduction 1993;8(3):379-84.
14. Yanira LP, Serene SS, Yarisie J, Anne E, Sabrina G and janet EH. Inverse Relationship between Luteinizing Hormone and body Mass Index in polycystic ovarian Syndrome. Investigation of Hypothalamic and Pituitary Contributions. J Clin Endorin & Metabol 2006. 91(4):1309-1316.
15. Luigi Parisi, MD, Maria Tramonti. MD, Silvio Casciano, MD, Alberto Zurli, MD, and Oscar Gazzarrini, MD. The Role of Ultrasound in the study of polycystic Ovarian Disease. Ultrasound 10:167-172, April 1982.
16. Takahasli K,Okada M and Ozaki T. Transvaginal ultrasonographic morphology in polycystic ovarian syndrome, Gynecol-Obstet-Invest 1995;39 (3):201-6.