

## Study of Hormone and Lipid Profile in Polycystic Ovarian Syndrome Women between the Age 18 to 30 Years

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### Abstract

*Background:* Polycystic Ovarian Syndrome (PCOS) is an intense problem which manifests later as infertility, obesity, insulin resistance, dyslipidemia, endothelial dysfunction & overt diabetes mellitus. PCOS is often associated with abnormalities of other endocrine glands. The study was undertaken to assess hormone levels and lipid profile in polycystic ovarian disease patients and compare it with age & gender matched healthy females. *Material and Method:* Total 90 subjects were enrolled in the present study, out of these 45 were PCOS patients between age group 18 to 30 years, 45 healthy age & sex matched individuals without any evidence of PCOS as per clinical examination was taken as control subjects. Serum Low density lipoprotein - cholesterol (LDL-C), High density lipoprotein cholesterol (HDL-C) Total cholesterol, Triglycerides (TG), Thyroid stimulating hormone, Total T3 & T4 levels were determined. *Results:* The results of present study show that, women with PCOS have altered lipid & hormone profiles. In current study serum total cholesterol & LDL-C were higher while HDL-cholesterol was lower as compared with healthy women ( $p < 0.01$ ) The TSH levels were significantly ( $p < 0.001$ ) increased in PCOS patients compared with healthy controls while total T3 & total T4 levels were normal in both groups. *Conclusion:* In present study, polycystic ovarian patients had subclinical hypothyroidism & this may be due to unopposed estrogen which stimulates autoimmune reaction like generation of Thyroid peroxidase antibodies. So Analysis of thyroid hormone profile may help in proper treatment. As lipid parameters were associated with the presence of PCOS which may used for assessment of cardiovascular risk in women with PCOS

**Keywords:** Polycystic Ovarian Syndrome; Thyroid Hormone; Lipid Profile.

### Introduction

According to National Institutes of Health, Polycystic Ovarian Syndrome (PCOS) is defined as ovulatory dysfunction with clinical evidence of hyperandrogenism and hyperandrogenemia in the absence of adrenal or thyroid disease including Cushing's syndrome, cancer and congenital adrenal hyperplasia [1]. It is the most important endocrine

disease of women with prevalence 4% to 12% [2]. It is complex disorders in which hormone regulating the egg development of ovaries with other metabolic pathways are affected [3]. So other condition like dyslipidemia, hypertension, cardiovascular disease, type 2 diabetes, cancer of breast, ovarian and endometrial have been associated in PCOS [1].

Alterations of luteinizing hormone (LH) and insulin resistance are common signs in PCOS. Patient with hyperinsulinemia and insulin resistant has been associated with dyslipidemia [4]. Women with PCOS may have an underactive thyroid gland and mild hypothyroidism complicates PCOS problems especially if women are obese in spite of regular diet and exercise. Thyroid hormones act as

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**Received:** 25.05.2017, **Accepted:** 13.06.2017

metabolic thermostat and if this metabolic thermostat is set at low level, it is difficult to lose weight and avoid sluggishness. If hypothyroidism is diagnosed and treated as early as possible, some of PCOS symptoms may diminish [5].

According to Rotterdam consensus workshop, PCOS is a syndrome of ovarian dysfunction with polycystic ovary morphology and hyperandrogenism. Thus no single criteria is sufficient for it [6]. Cristiah -Loan et.al have shown that the women with polycystic ovary syndrome altered lipid profile with higher cholesterol levels (both total and Low density lipoprotein) and lower high density lipoprotein- cholesterol compared with healthy women [7].

Thus, PCOS can be associated with reproductive and metabolic abnormalities whose diagnosis is based on anthropometric, biochemical and radiological abnormalities. In view of above information and several risk of complication, it is precious to study the hormonal and lipid profile in women with PCOS. Very few studies have been reported for correlation of hormonal and lipid profile testing and its application in Indian context. The aim of present study was one such attempt to measure lipid parameters, thyroid hormone and evaluate its clinical performance in PCOS women between the age 18 to 30 years.

## Material and Method

The present study was conducted at Department of Biochemistry Medical College collaboration with Department of OBST and GYNAE. The study has approved by Institutional Ethics Committee with all participants providing informed consent and utmost care was taken during experimental procedure according to the declaration of Helsinki 1975.

### Study Design

Present study was analytical case control study. Total 90 subjects were enrolled in the present study. Sampling was done by using simple random sampling type. In present study, population was not universe. Study was carried on available individual's that was accessible population.

### Sample Size Calculation

Present study will be quantitative study thus the sample size calculated by using the following formula.

$$\text{Sample size } n = 4 \times \sigma^2 / E^2$$

n=sample size,  $\sigma$ =Standard deviation in population E= Allowable error

### Control Group

45 healthy age and sex matched individuals without any evidence of PCOS as per clinical examinations were taken as control subjects.

### Patients Group

The study included total 45 patients between age group 18 to 30 years of PCOS. They were taken from outpatients attending the Obstetrics and Gynecology department of same hospitals.

### Inclusion Criteria

Subject with oligo/amenorrhea, transvaginal sonography suggesting polycystic ovary and features of hyperandrogenemia, nonpregnant, not taking medication like oral contraceptive or any other medicine for last six month which alter thyroid hormone level was included.

### Exclusion Criteria

Subject with pregnancy, systemic disease like liver, kidney, heart etc. associated other endocrine disorder i.e. hypothyroidism, hyperprolactinemia was excluded. As well as above subject taken with above mentioned medication also excluded from the study.

### Collection of Sample

4ml blood sample was collected in plain vacutainer from patients and controls between 9.00 to 11.00 am after fasting from 10.00 pm from previous day by using 20G disposable needle from cubital vein with aseptic precaution. The separated serum was collected in polythene tube with cork and stored at 20°C (precaution was taken to avoid the hemolysis) and was used for analysis of respective parameters.

### Estimation of Thyroid Hormone Level and Lipid Profile

Various biochemical parameters like serum T3, T4, Thyroid Stimulating Hormone were estimated. Hormone profile was measured by using enzyme linked immunosorbent assay (ELISA) method [8,9]. Serum total cholesterol and HDL-C were determined by CHOD-PAP method. Serum triglyceride (TG) was measured enzymatic GPO-PAP method end point

assay (using kit manufactured by span diagnostic Ltd) using semi-autoanalyser. LDL-C calculated by using friedewald formula (LDL-C= total cholesterol-TG/5- HDL-C) [10,11].

### Statistical Analysis

The statistical analysis was carried out by using the SYSTAT software version 12. The results were expressed in Mean± Standard Deviation (Mean±SD). To test the significance between the study group and the control groups, data was were analysed by student's t-test. p value p<0.001 and P< 0.01 were considered to be statistically highly significant.

### Results

Table No.1 showed that baselines characters and lipid profile in PCOS and control groups. In current study, serum total cholesterol, LDL-C, level were significantly increased (p<0.01) and HDL-C was decreased in PCOS group when compared with healthy control group. Table 2 illustrated that, the comparison of thyroid hormone levels in PCOS and control groups. In this study, serum level thyroid stimulating hormone was significantly higher (p<0.001) in PCOS women as compared with healthy control women.

**Table 1:** Baseline characteristics & lipid profile in PCOS& control groups

Parameters	PCOS Group n=45	Control Group n=45	P-value
Age (years)	30.1 ± 2.8	29.3± 6.2	--
BMI(Kg /m <sup>2</sup> )	36.1± 4.3	30.1 ± 4.0	--
Total cholesterol (mg/ dl)	225.8 ± 60.1	168.4± 36.7	<0.01
HDL-c (mg/ dl)	42.8 ± 9.4	50.8 ±15.1 .0.02	<0.01
LDL_C (mg/ dl)	131.7 ± 45.3	90.2 ± 32.2 <0.00	<0.01
TG (mg/ dl)	110.3 ±66.5	120.6 ± 81.1 0.14	0.14

**Table 2:** Comparison of thyroid hormone levels in PCOS group and control group

Parameters	PCOS Group N=45	Control Group n=45	P value
T3 (ng/ ml)	1.20 ± 0.33	1.38 ± 0.5	>0.05
T4 (mcq/ dl)	7.7 ± 0.89	6.42 ± 1.65	>0.05
TSH ( µIU/ ml)	8.33 ± 0.59	1.2 ± 0.11	<0.001

### Discussion

The polycystic ovary syndrome is considered the most common gynecological endocrinopathy characterised by Hyperandrogenism [1]. It is a heterogeneous collection of sign and symptoms that gathered together form a spectrum of a disorder with a mild presentation in some and in others a severe disturbance of reproductive, endocrine and metabolic function [12]. Adequate levels of circulating thyroid hormone are of primary importance for normal reproduction function. Any impairment may develop the disturbances of female reproductive function [13]. Women suffering from PCOS are considered to be at high risk for dyslipidemia due to elevated androgen level and frequent association of this syndrome with obesity [7].

In current study, no statistical difference in serum level of T3 and T4 was seen in both groups. The serum TSH level was increased significantly in PCOS group when compared with control group. Result suggests the hypothyroidism in the PCOS. Our results were strongly supported to the previous research. According to Archana Shirsath et al. higher the serum

TSH level in PCOS, which may be due to unopposed estrogen which stimulates autoimmune reaction like generation of thyroid peroxidase antibodies which may lead to subclinical hypothyroidism in PCOS [5]. Janseen et al, Abalovich M et al have reported that a threefold higher prevalence of hypothyroidism in patients with PCOS [14,15]. Ravi B.V. and Sadana Roshni Gokaldas tried to find out correlation of thyroid stimulating hormone and insulin resistance in women with PCOS. According to them, no any significant correlation between serum TSH level, serum insulin and body mass index in PCOS. There was no statistically significant increase in TSH level in PCOS compared with control which was exactly controversial our results [16].

In present study, there were high level of total cholesterol, LDL-C and low level of HDL-C was observed in women with PCOS when compared with healthy women. Our results were matched with previous study. Cristaian Joan IUMAAS et al have demonstrated that women with PCOS have altered lipid profile [7]. Sidhwan s et al have studied the association with atherogenic changes in lipoprotein particles number and size independent of the body

weight. They demonstrated that independent of body weight, PCOS was associated with changes in lipoprotein profile that increases risk of cardiovascular disease. They also reported that increase LDL particle number and decrease LDL size which suggest that androgen may play important role in pathogenesis of lipid abnormalities in PCOS [17]. Sarama Saha et al have investigated on correlation between serum lipid profile and carotid intima media thickness in polycystic ovarian syndrome. According to their study, in polycystic ovary syndrome women carotid intima- media thickness was positively correlated with serum total cholesterol, TG and LDL- cholesterol and negatively correlated with serum HDL-C which suggests that even young polycystic ovary syndrome women are prone to atherosclerosis from early age [18]. Cihan Inan and Cinan Karadag have reported that the group without polycystic ovary morphology had higher risk than the other groups in terms of increased insulin resistance, dyslipidemia and cardiovascular disease due to effects of hyperandrogenism [19]. Contrary to our results, Abdulaziz A- Mulhim et al have showed that there were no differences in the blood sugar level, cholesterol, TG and LDL-C and HDL-C seen in PCOS. Lipid profile was not altered in their study which may be due to the fact that women included their study were relatively young [20].

### Conclusion

Finding of present study concluded that, polycystic ovarian patients had subclinical hypothyroidism & this is may be due to unopposed estrogen which stimulates autoimmune reaction like generation of Thyroid peroxidase antibodies. So Analysis of thyroid hormone profile may help in proper treatment. As lipid parameters were associated with the presence of PCOS due to effect of hyperandrogenism and it might useful for assessment of cardiovascular risk in women with PCOS.

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