



## Lipid Profile in Women with Polycystic Ovary Syndrome

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### Abstract

**Objective:** Polycystic ovary syndrome (PCOS) is a disorder of hyperandrogenemia and chronic anovulation, which affects 5-10% of all women. It has been reported that women with PCOS often have serum lipid level elevation. This study compares serum lipid levels in women with and without PCOS.

**Materials and Methods:** Lipid profile [total cholesterol (TC), apolipoprotein A-I, apolipoprotein B, high-density lipoprotein (HDL), low density lipoprotein (LDL), triglyceride (TG), and lipoprotein a] in this comparative cross-sectional study were compared between 33 women with and 44 women without PCOS. All biochemical tests were done using fasting blood samples which were frozen in  $-80^{\circ}\text{C}$  since the previous study. Other data were collected from Iranian twin bank. Data were analyzed with SPSS.  $P < 0.05$  considered as significant level.

**Results:** There was no significant difference between two groups in terms of age, age of menarche and body mass index (BMI). Serum levels of TC, apolipoprotein B, apolipoprotein A-1, HDL, LDL, TG, and lipoprotein did not show any difference between two groups. TG in PCOS women with BMI  $>25$  was significantly higher in comparison with non-PCOS.

**Conclusion:** The present study does not support the notion that PCOS affects serum lipid levels except in the term of TG in PCOS women with BMI  $> 25$ . It is suggested to repeat this study within PCOS patients who are insulin resistance.

**Keywords:** Apolipoprotein A-1, Apolipoprotein B Dyslipidemias, Lipids, Polycystic Ovary Syndrome

### Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in 5-10% of women of reproductive age (1). This syndrome is characterized by hyperandrogenism and chronic anovulation (2-4) associated with a broad range of clinical and biochemical features, including hirsutism, acne, menstrual irregularities, obesity, infertility (5-7), hyperinsulinemia, glucose intolerance, and dyslipidemia (8). Presence and pathogenesis of lipid abnormalities in PCOS has remained controversial. Some studies have shown lipid disturbances in PCOS women is higher than healthy women (9,10). Thus,

these women would be susceptible to be at cardiovascular risk even in younger age. In the other words, lipid disturbances in PCOS women could be a risk factor of early atherosclerosis and consequently, cardiovascular disease (11,12).

Based on the importance of lipid abnormalities and its association with cardiovascular disease especially in PCOS women, the aim of this study was to compare the lipid profiles and its sub groups in women with and without PCOS.

### Materials and Methods

This comparative cross-sectional study was a phase of

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a twin study which included 76 subjects of 15-45 years of age (32 with and 44 without PCOS). Ethical approval was obtained from Ethics Committee of the Avicenna Research Center, and all women had signed a written informed consent. All women were one of the twins. They all were living in Tehran, Iran. The study was carried out at Avicenna Research Center, with the cooperation of Iran Nursing care Research Center and the Iran University of Medical Sciences, Tehran. All biochemical tests were done using fasting blood samples, which were frozen in  $-80^{\circ}\text{C}$  since the previous study (13). In that study, all subjects examined clinically and then were done ultrasound examination and blood tests during their early follicular phase. If subjects had not normal menses, then these were made at the first possible time. Exclusion criteria were as follows: Oral contraceptive pills or any hormones consumption, pregnancy or breastfeeding, and serum 17-hydroxyprogesterone elevation. Other data such as demographics also collected from Iranian twin bank. The polycystic diagnosis was confirmed regarding clinical, biochemical characteristics, and using ultrasound of these subjects (13).

Biochemical measurements included the followings: Total cholesterol (TC), apolipoprotein A-I, apolipoprotein B, high-density lipoprotein (HDL), low density lipoprotein (LDL), triglyceride [TG], and lipoprotein a. Demographic variables included age, age of menarche, weight and height. Body mass index (BMI) was calculated ( $\text{weight}/\text{height}^2$ ). Finally, these measurements were compared regarding to PCOS and non-PCOS groups as well as two BMI groups ( $\leq 25$  and more than 25). Data were analyzed using SPSS software (version 14, SPSS Inc., Chicago, IL, USA).

Student's t-test was used to compare quantitative and qualitative variables, respectively.  $P < 0.05$  was considered as statistically significant.

## Results

The final database included 76 individuals (44 without and 32 with PCOS). The mean of age was  $21.53 \pm 6.51$  (15-36) years in PCOS and  $21.50 \pm 6.46$  (15-42) years in non-PCOS group. The mean of age of

menarche among women with and without PCOS was  $12.40 \pm 1.16$  (11-16) and  $12.68 \pm 1.17$  (9-16) years respectively and the mean of BMI was  $23.33 \pm 4.77$  (16.36-34.29) and  $22.62 \pm 4.18$  (15.79-41.53)  $\text{kg}/\text{m}^2$  in two groups, respectively. No significant difference was observed between the two groups (with or without PCOS) for above variables.

Table 1 summarizes the biochemical findings of subjects with and without PCOS. As is demonstrated in table 1, all biochemical tests didn't show any significant difference between two groups. In the case of apolipoprotein A-I in women with PCOS, although it is not significantly higher than women without PCOS, but it is near to the significance level ( $P = 0.05$ ).

When biochemical findings are compared between the two groups with and without PCOS stratified by their BMI (Table 2), a significant difference is observed for TG. Otherwise, the TG levels in PCOS women with  $\text{BMI} > 25$  is significantly higher than those who have  $\text{BMI} \leq 25$  ( $P = 0.04$ ). Women without PCOS did not show any differences between all biochemical tests in BMI groups.

## Discussion

Unlike some studies (9,10), we did not find any significant differences between two groups in terms of TC, LDL, HDL, TG, apolipoprotein B, apolipoprotein A-1, and lipoprotein a levels. Bickerton et al., also found no significant differences in terms of lipids and lipoproteins between PCOS and non-PCOS women (8). Bahceci et al.'s findings suggests that the level of LDL, HDL, insulin, glucose, apolipoprotein A1, and lipoprotein a, in women with and without PCOS do not show any significant differences (3). Similarly, Jahanfar et al., in a study aimed at evaluating the genetic and environmental factors affecting lipids among twins, found no significant differences between women with and without PCOS in serum TC, HDL-C, TG, lipoprotein a, and apolipoprotein B (14). Valkenburg et al., showed when lipid changes occur in PCOS women, this may be affected by obesity and hyperandrogenism (12). In other words, obesity in PCOS women would be the most important factor for metabolic abnormalities and cardiovascular risks (15).

**Table 1.** Biochemical findings of women with PCOS (n = 32) and without PCOS (n = 44)

Parameters	With PCOS (n = 32)	Without PCOS (n = 44)	P*
	Mean $\pm$ SD	Mean $\pm$ SD	
TC (mg/dl)	206.26 $\pm$ 68.74	211.92 $\pm$ 64.61	0.71
HDL (mg/dl)	56.81 $\pm$ 25.91	55.34 $\pm$ 18.02	0.77
LDL (mg/dl)	113.39 $\pm$ 39.15	116.97 $\pm$ 44.92	0.71
TG (mg/dl)	135.03 $\pm$ 151.40	116.55 $\pm$ 45.81	0.44
Apolipoprotein A-1 (mg/dl)	153.21 $\pm$ 27.05	140.94 $\pm$ 27.16	0.05
Apolipoprotein B (mg/dl)	99.81 $\pm$ 29.69	99.98 $\pm$ 28.81	0.67
Lipoprotein a (mg/dl)	27.75 $\pm$ 26.66	24.67 $\pm$ 20.19	0.56

\*  $P \leq 0.05$  is significant; Student's t-test and  $\chi^2$  test was used to compare variable data; PCOS: Polycystic ovary syndrome; SD: Standard deviation; TC: Total cholesterol; HDL: High-density lipoprotein; LDL: Low density lipoprotein; TG: Triglyceride

**Table 2.** Biochemical findings of women with and without polycystic ovary syndrome (PCOS) based on their body mass index (BMI)

Groups		BMI ≤ 25	BMI > 25	P*
		Mean ± SD (n = 31)	Mean ± SD (n = 13)	
Without PCOS	TC (mg/dl)	210.98 ± 61.23	218.20 ± 76.50	0.74
	HDL(mg/dl)	57.16 ± 19.83	50.75 ± 12.79	0.30
	LDL(mg/dl)	115.30 ± 45.54	123.79 ± 45.73	0.58
	TG (mg/dl)	122.30 ± 46.20	104.62 ± 44.99	0.26
	Apolipoprotein A-1 (mg/dl)	140.72 ± 23.62	144.91 ± 34.55	0.65
	Apolipoprotein B (mg/dl)	97.50 ± 29.44	97.45 ± 28.95	0.99
	Lipoprotein a (mg/dl)	22.69 ± 13.84	31.66 ± 30.97	0.19
With PCOS		(n = 24)	(n = 8)	
	TC (mg/dl)	205.08 ± 60.50	209.81 ± 94.22	0.86
	HDL (mg/dl)	60.12 ± 24.18	46.87 ± 30.02	0.21
	LDL (mg/dl)	114.62 ± 36.98	109.68 ± 47.68	0.76
	TG (mg/dl)	104.50 ± 42.84	226.62 ± 287.58	0.04*
	Apolipoprotein A-1 (mg/dl)	148.75 ± 27.38	166.62 ± 22.42	0.10
	Apolipoprotein B (mg/dl)	98.62 ± 27.22	103.37 ± 38.10	0.70
Lipoprotein a (mg/dl)	31.64 ± 29.60	16.06 ± 7.72	0.15	

\* P ≤ 0.05 is significant; Student's t-test and  $\chi^2$  test was used to compare variable data; BMI: Body mass index; SD: Standard deviation; PCOS: Polycystic ovary syndrome; TC: Total cholesterol; HDL: High-density lipoprotein; LDL: Low density lipoprotein; TG: Triglyceride

In the present study, we observed this effect on TG. When subjects were classified according to their BMI ( $\leq 25$  and higher than  $25 \text{ kg/m}^2$ ), higher serum level of TG was observed in PCOS women ( $P = 0.04$ ). According to Swetha et al., higher TC, TGs, LDL-cholesterol and very LDL cholesterol in PCOS women in comparison with control may confirm a positive association between glucose and BMI with dyslipidaemia in PCOS women (9). It seems elevated insulin concentrations can increase VLDL and TG. Besides, this process can cause increased intermediate-density and low-density lipoproteins (4).

Silfen et al. (16) and Savic et al. (17) also showed that LDL and HDL levels in women with PCOS are affected by their weight so that, obese women had higher LDL and lower HDL levels than lean women. They argue although dyslipidemia is one of the problems in women with PCOS but cannot be considered as a manifestation of this syndrome. Glueck et al. studied the relationship between obesity, free testosterone and cardiovascular risk factors among adults with PCOS who have regular menstrual cycles. Their results showed that PCOS patients have higher values of BMI, insulin, TGs, LDL, free testosterone level and lower HDL than the control group (18). Rizzo et al. believe that insulin resistance as one of the PCOS manifestations can cause some degree of glucose intolerance or diabetes Type II in more than 40 percent of these patients, which these disorders can intensification by obesity (11).

In this paper, we did not study androgens and insulin level or insulin resistant. Hence, our results may confound by patients androgens or insulin resistant status. Another limitation of our study is that we could not examine lean PCOS women with controls because of the limited number of these women in our samples.

In conclusion, although many studies attempted to evaluate the effect of PCOS on serum lipids, some of them demonstrate a higher level of dyslipidemia, especially in PCOS women with higher BMI and

insulin levels. In our study, we did not find any differences in PCOS women lipid profile in comparison with healthy ones but our results suggest a higher serum TG levels among PCOS cases with BMI higher than  $25 \text{ kg/m}^2$  compared with  $\text{BMI} \leq 25 \text{ kg/m}^2$ . Further studies with higher sample size are warranted to confirm these results. It is suggested to repeat this study within PCOS patients who are insulin resistance.

#### Ethical issues

We have no ethical issues to declare.

#### Conflict of interests

We declare that we have no conflict of interests.

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