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The relationship between obesity and polycystic ovary syndrome in a sample of Iraqi infertile women

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Abstract: Polycystic ovary syndrome (PCOS) is the most common endocrine disorder among women of reproductive age, which negatively affects various health systems. **Objective:** The aim of this study was to investigate biochemical parameters and interleukin-6 according to the ovarian morphology in PCOS. **Materials and Method:** This study was a cross-sectional of clinically diagnosed 50 females of PCOS and another 50 age matched female subjects were studied as the control population. Obesity PCOS and biochemical parameters involved lipid profile test and human interleukin 6 (IL6),. **Results**: The mean IL6, Triglyceride, high-density lipoprotein (HDL cholesterol), and very low Density lipoprotein-cholesterol (VLDL-cholesterol) are significantly higher in women with PCOS as compared to controls. But the cholesterol and Low Density lipoprotein cholesterol (LDL -cholesterol) are no significantly. **Conclusion**: The IL-6 correlated positively with body mass index ($P < .01$) in obese controls and women with PCOS.

Key words: IL6, Polycystic ovary syndrome, obesity, Low Density lipoprotein

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Introduction:

Polycystic ovarian syndrome (PCOS) affect the ovaries in females is a one type endocrine disorder. Many cysts can be easily identifies inside the ovaries through ultrasound. The major causes if PCOS are excess androgen production in female body and insulin resistance. Testosterone is considered as the main reason to experiencing PCOS in girls and women's(1).

PCOS shares components with the metabolic syndrome and has broad health implications. Lipid abnormalities, including elevated low-density lipoprotein (LDL), triglyceride levels and decreased high-density lipoprotein (HDL), are often found in women with PCOS. It is clear that obesity, insulin resistance and hyperandrogenism coexist in PCOS, and have independent and interactive effects on dyslipidemia, although the mechanisms of these interactions remain elusive (2).

The obesity is a common finding in PCOS and aggravates many of its reproductive and metabolic features. The relationship between PCOS and obesity is complex, not well understood, and most likely involves interaction of genetic and environmental factors.(3). The weight of the female also increases during PCOS resulting in more severe hyperandrogenism. The major cause of the PCOS is insulin resistance, anovulation, pituitary dysfunction, enhanced ovarian androgen production (4, 5). Showed that serum insulin levels and homeostasis model assessment - Insulin resistance (HOMA-IR) values

were significantly ($p<0.05$) higher in PCOS women than controls. Total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL-C) levels were also significantly ($p<0.05$) higher in PCOS. Vgontzas *et al*., (6) showed that the IL-6 levels had a stronger association with the PCOS group than with the obese group, and the sleep or hypoxia variables did not make a significant contribution to either IL-6 or Tumor necrosis factor- α (TNF-*α).* Both IL-6 and TNF-*α* correlated positively with body mass index (*P* < .01) in obese controls but not in women with PCOS. Furthermore, within the PCOS group, IL-6 and TNF-*α* correlated more strongly with indices of insulin resistance than obesity. They concluded that IL-6 levels are elevated in obese women with PCOS independently of obesity or sleep apnea and may represent a pathophysiologic link to insulin resistance.

The aim of this study was to investigate relationships between biochemical parameters and interleukin-6 (obesity) according to the PCOS among Iraqi women.

Materials and Methods:

This study was conducted during the period from November 2017 to April 2018. The sample collection performed in Kamal Al-Samarrai hospital. The total numbers of samples are100 practicing person include 50 sample from infertile Iraqi women and 50 samples from Healthy control. Every participant woman has been interviewed and asked to answer information including sociodemographic data, menstrual history, gynecological surgery, obstetric, PCOS family histories. They have been also subjected to medical checkup for signs of hyperandrogenism and polycystic ovary.

Biochemical tests involved lipid profile test which includes Total Cholesterol Test, Triglyceride Test, and HDL Test, VLDL Test and LDL Test.Kits that used in this method form Linear Company / Spain. The component of kits.

Statistical Analysis:

The Statistical Analysis System-SAS program was used to effect of difference factors in study parameters. T-Test was used to significant compare between means. Estimate of correlation coefficient between variables in this study (7).

Results and Discussion:

The control group (n=50) consisted of apparently healthy subjects who were check-up without any systemic disorder. All of the women in the control group regular menses, every 21–35 days. None of the women in the control group had polycystic ovary on ultrasound; the results are shown in Table (1). a highly significant elevation ($p<0.01$) in the level of Polycystic ovarian syndrome in each of patients and control group, there are many studies agree with it (8 , 9).

The effects of polycystic ovary syndrome (PCOS) and body mass index (BMI) on selected indicators of IL-6 and another hormone. BMI (kg/m^2) was analyzed as 27.91 ± 0.65 for patients and 25.44 ± 0.67 for control with high significant ($P< 0.01$)(Table -1). These results was agree with another study by Cresswell *et al.*,(10) who found that body Mass Index **(**BMI) Obesity increases insulin resistance, and the presence of polycystic ovaries increases

insulin resistance. The presence of polycystic ovaries appears to have a stronger influence than obesity on insulin resistance. The Iraqi environment suffered from pollution that might causes women infertile, and increase the infertility in females, because the hormonal system in females is more sensitive to environmental variations (11). Also, the Iraqi society suffered from many psychological difficulties that affect women's behavior which leads to disturb the female hormonal system that might be lead to PCOS (12) . Sam *et al*., (13) showed that age and BMI did not differ between the groups. Hispanic women with PCOS had higher waist-to-hip ratio (WHR) ($P = 0.02$).

Also, from the table (1) show the relationship between IL-6 and PCOS. Women with PCOS exhibited higher plasma concentrations of IL-6 than controls, who had intermediate values, or normal-weight controls, who had the lowest values (43.83 ± 3.38 vs 35.01 ± 1.31 pg/mL, respectively $p < .05$). These results agree with another study by Vgontzas *et al*.,(6) who found that women with PCOS exhibited higher plasma concentrations of IL-6 than obese controls, who had intermediate values, or normal-weight controls, who had the lowest values (4.75 ± 0.5 vs 3.65 ± 0.4 vs 1.84 ± 0.3 pg/mL respectively $P < 0.01$).

Table (1): The compare between patients and control in Age, BMI and IL-6

Group	Mean ± SE		
	Age (year)	BMI (kg/m^2)	IL-6 (pg/ml)
Patients	26.38 ± 0.63	27.91 ± 0.65	43.83 ± 3.38
Control	29.13 ± 0.85	25.44 ± 0.67	35.01 ± 1.31
T-Test	2.073 **	1.883 **	8.150 *
P-value	0.0098	0.0107	0.0342

*** (P<0.05) , ** (P<0.01).**

From the Table (2) showed that no significant differences cholesterol levels (mg/ml) in PCOS women compared with control (129.69± 3.93 *versus* 129.21± 4.28, respectively (Figure 1) while the level of Triglyceride (mg/ml) was significant P< 0.05 in PCOS women with control women (120.22± 8.38 versus 97.32 ±5.20, respectively). (Figure 2). Also HDL-cholesterol and VLDL-cholesterol (mg/ml) were 49.29±1.03 and 24.04±1.67 with significant differences (p<0.05) compared with control women which found 53.62±1.25 versus 19.39±1.04 respectively. (Figure 3 and 4) But the result of low-density lipoprotein (LDL) cholesterol shows that the patients with PCOS and control women were 56.46±3.80 versus 56.21±4.52 mg/ml respectively with no significant differences (Figure 5).

These results is agree with Sam *et al*., (13) Non-Hispanic white women had significantly higher HDL cholesterol compared with Hispanic women . There were no differences between groups in LDL cholesterol (p = 0.80). LDL particle number (LDL-PN) was highest in Hispanic (1386 ± 514 nmol/l) compared with non-Hispanic black (1146 ± 458 nmol/l) and non-Hispanic white women (936 ± 290 nmol/l) and this difference achieved

statistical significance between Hispanic and non-Hispanic white women. And disagree with the results triglyceride which they found that there were no differences between groups in triglyceride levels. Also , Kim and Choi (14) found that the triglycerides and low-density lipoprotein (LDL) cholesterol levels were 26 mg/dL and 12 mg/dL higher, and high-density lipoprotein cholesterol concentration was 6 mg/dL lower in women with PCOS than those of control

Table (2): The compare between patients and control in Lipid profile

Group	Mean ± SE				
	Cholesterol (mg/ml)	**Triglyceride (mg/ml)**	**HDL-Cholesterol (mg/ml)**	**VLDL – Cholesterol (mg/ml)**	**LDL-Cholesterol (mg/ml)**
Patients (n=50)	129.69 ± 3.93	120.22 ± 8.38	49.29 ± 1.03	24.04 ± 1.67	56.46 ± 3.80
Control (n=50)	129.21 ± 4.28	97.32 ± 5.20	53.62 ± 1.25	19.39 ± 1.04	56.21 ± 4.52
T-Test	11.68 NS	21.345 *	3.078 *	4.269 *	11.70 NS
P-value	0.935	0.036	0.0294	0.033	0.966

*** (P<0.05) , NS: Non-Significant.**

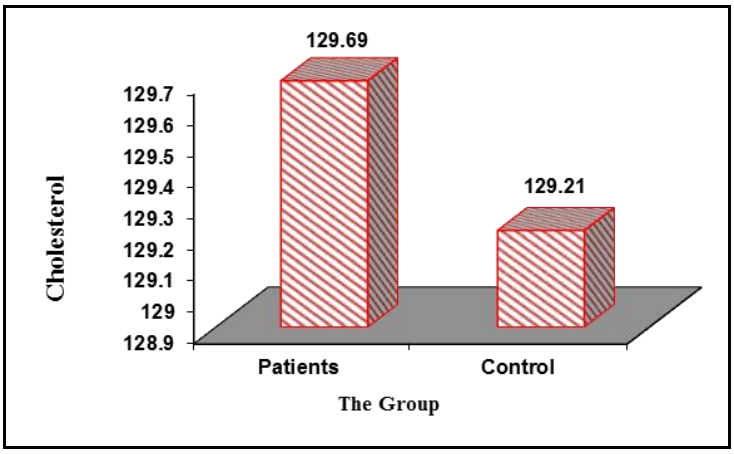

Figure (1): Compare between patients and control in Cholesterol.

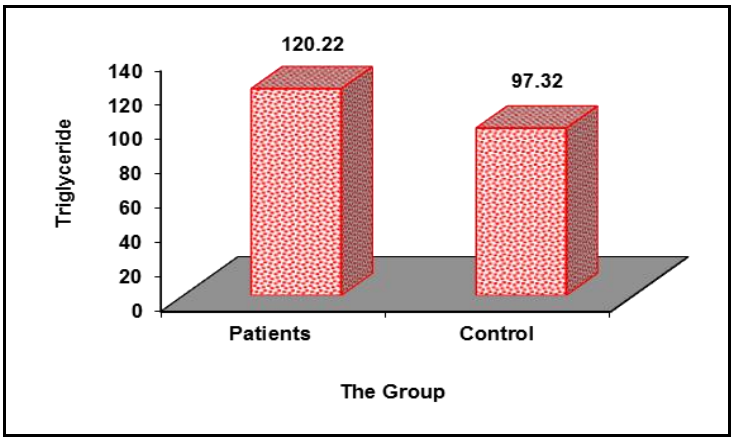

Figure (2): Compare between patients and control in Triglyceride.

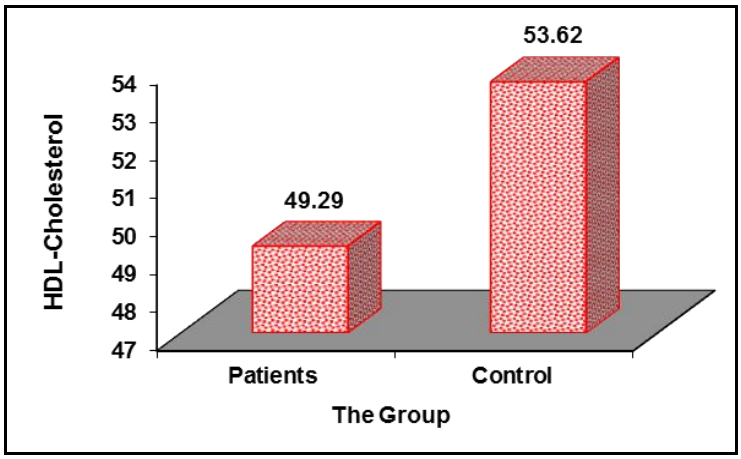

Figure (3): Compare between patients and control in HDL.

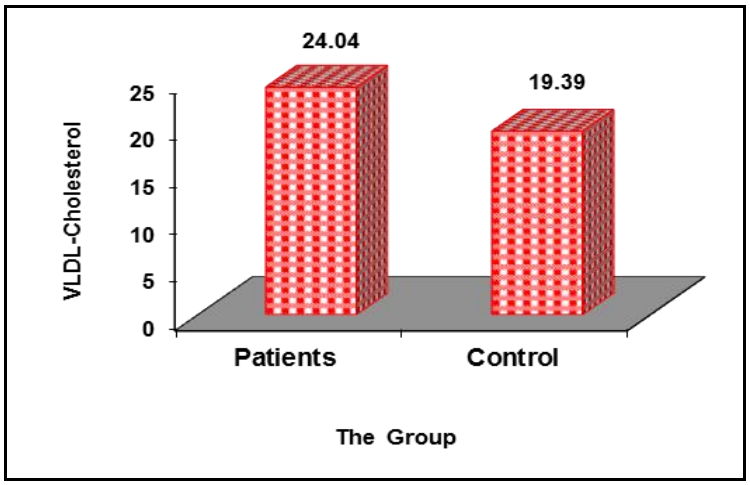

Figure (4): Compare between patients and control in VLDL.

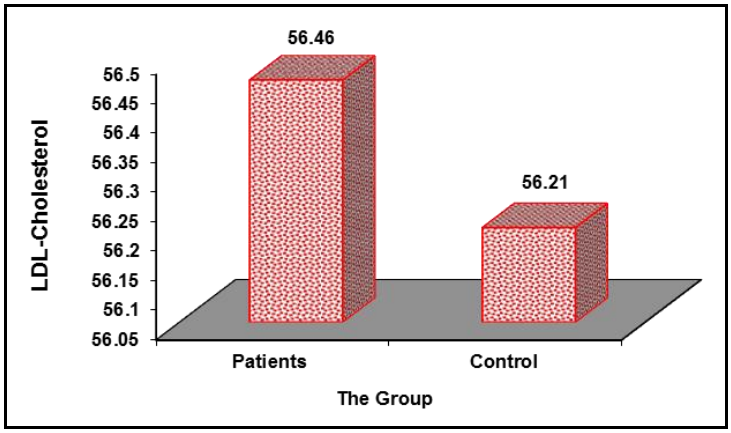

Figure (5): Compare between patients and control in LDL.

Table (3) shown that the correlation coefficient between IL-6 and Lipid profile all the parameters cholesterol and Triglyceride, HDL-C, LDL-C and VLDL-C with the no significant difference ($P<0.05$) in patients with PCOS and control women. Wild (15) found that women with PCOS were

higher triglyceride, lower HDL-cholesterol , and higher non HDL cholesterol levels than their non-PCOS counterparts.

Table (3): The correlation coefficient between IL-6 and parameters of patients

Parameters	Correlation coefficient-r with IL-6
Cholesterol	0.02 NS
Triglyceride	-0.004 NS
HDL-C	0.06 NS
VLDL-C	-0.003 NS
LDL-C	-0.004 NS

*** (P<0.05) , NS: Non-Significant.**

We can conclude that our study has a number of limitations. The sample size in each group was small and our findings require confirmation in larger studies. However, despite these limitations, there were significant differences in metabolic parameters between the three ethnic / racial groups of similar age and BMI. Also, the patient with PCOS should receive a complete lipid test, and lifestyle modification, including diet and exercise, is the first line therapy for all PCOS patient and is particularly important for those with dyslipidemia.

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