

Evaluation of the Level of the Inflammatory Factor Interleukin-6 in Patients with Polycystic Ovaries and Insulin Resistance

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Abstract

Polycystic ovarian syndrome (PCOS) is a prevalent endocrine disease, with a rate of 6%–20% among females of reproductive age, according to the diagnostic criteria represented by the high male hormone, irregular menstruation, imbalances in hormones, and metabolic disorders. Insulin resistance (IR) is an imbalance in the amount of insulin secreted. This raises the danger of type 2 diabetes and heart disease. Evaluate the inflammatory factor (interleukin-6 [IL-6]) in the serum of those with IR and PCOS and its comparison with the control group. A case and control study included 80 females of reproductive age (16–40) years; 40 females had IR and polycystic ovary syndrome taken as the first group, as for the second group included 40 healthy women. Every sample was taken between October 2022 and February 2023. The following analysis was done (IL-6). The study's findings showed a difference in the biostatistics of the level of IL-6 between the PCOS and IR group with the control group, as well as when compared in the group of patients in terms of age, it showed the correlation factor between IL-6 and IR. It was found that the level of IL in those with PCOS and IR was higher than the control group, as well as the increase in age in the group of patients, the level of IL-6 increased, and it showed that there was no significant value between IL-6 and IR.

Keywords: Insulin resistance, interleukin-6, polycystic ovarian syndrome

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is one of the most typical endocrine conditions that affects women in their reproductive age; depending on the diagnostic criteria used, this illness can have an incidence of anywhere between 6% and 20% worldwide, PCOS is a hormonal disease that causes women to have higher levels of the female hormone androgen and luteinizing hormone to follicle-stimulating hormone ratio. Cysts, infertility, excessive facial and body hair growth (hirsutism), acne, and immaturity of the ovaries are among the symptoms.^[1] Female PCOS patients are more likely to develop obesity, hypertension, and dyslipidemia.^[2]

Given the variety of its clinical manifestations, the cause or causes of PCOS are still unknown. Several factors contribute to the growth of PCOS. Hyperandrogenism is the primary clinical indicator for identifying PCOS.^[3] According to statistics, at least 80% of females who have PCOS have hyperandrogenic indications or symptoms, such

as hirsutism, acne, or alopecia. Several different factors lead to PCOS, including genetic, lifestyle, and environmental factors.^[4] Endocrine disorders, insulin resistance (IR), and hyperinsulinemia are brought on by environmental factors that alter the action of insulin, obesity, and weight gain.^[5] IR is a major pathogenic element in the development of PCOS.^[6] IR is the final stage of chronic pancreatitis and is frequently seen in people with metabolic syndrome and type 2 diabetes; it defines the failure of function normally (glucose absorption, metabolism, storage) as a result of the failure of the target organs to respond. Increased insulin needs as a result of poor insulin-mediated glucose absorption in skeletal muscle and fat and insufficient suppression of

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hepatic glucose synthesis. Hyperglycemia develops when increased insulin requirements do not match insulin levels; IR is linked to obesity, hyperlipidemia, hypertension, cardiovascular disease, and inflammation.^[7] Interleukin-6 (IL-6) is a multidirectional cytokine that has diverse biological functions (inflammation, acute-phase response, and hematopoiesis),^[8] that was originally identified as an inducible factor for B-cell, which has a role in the maturation of antibody-producing cells, IL-6 is also the strongest indicator of cardiovascular conditions and cardiovascular, it refers to all possible causes of death, heart failure, mortality, and myocardial infarction resulting from cancer patients with healthy coronary heart disease. It may play a role as a marker for a pathophysiological pathway^[9] and also enhances innate immunity and pathogen eradication.^[10]

Aims of the study

- This study was designed to evaluate the inflammatory factor IL-6 in the serum of those with IR and PCOS and its comparison with the control group.
- As well as the statement of the effect of age on the group of patients. And a correlation factor between interleukin and IR.

MATERIALS AND METHODS

This study included 40 patients women with PCOS and IR taken as the first group, as for the second group included 40 healthy women, women with age ranged (16–40) years within reproductive age. All samples were taken between October 2022 and February 2023 at the maternity outpatient clinics and the Gynecological and Obstetric Teaching Hospital in Karbala city on the second and third day of the menstrual cycle (early follicular phase) in order to do the testing for IL-6 was measured with a Maglumi-800 device from Snibe Company in China, the IL-6 assay is a sandwich chemiluminescence immunoassay, IR was measured according to the HOMA-IR where be calculated as the result of fasting plasma glucose and insulin levels divided by a fixed amount.^[11] An amount of 5mL of blood was drawn into gelatin tubes (sometimes called gel tubes) using a 5mL medical syringe. The samples were allowed to stand at room temperature for 15min before the serum was separated and maintained at -20°C unless it was immediately needed.

Ethical approval

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. It was carried out with patients' verbal and

analytical approval before the sample was taken. The study protocol and the subject information, and the consent form were reviewed and approved by a local ethics committee according to document number 145 (including the number and the date on July 25, 2022) to get this approval.

Data analysis

Statistical analysis was carried out using SPSS version 27 (IBM Corp, Armonk , New York). Categorical variables were presented as frequencies and percentages. Continuous variables were presented as (means $\pm$ SD). Pearson Chi-square test and Fisher's exact test were used to find the association between categorical variables. Correlation coefficient (*r*) was used to assess the relationship between two continuous variables. A *P*-value of ≤ 0.05 was considered as significant.

RESULTS

As a result of the study's groups (PCOS, IR, and control group), the mean levels of human IL-6 (pg/mL) varied significantly. According to Table 1, most of the vital signs of (PCOS and IR) patients are greater than those of the control group by a significant amount.

This study also distributed patients with PCOS and IR according to age (years), including (<30 years and ≥ 30 years). When comparing two age groups, human IL-6 (pg/mL) means varied significantly.

DISCUSSION

In the current study data, as the mean of IL-6 increased in the group of patients with IR and polycystic ovaries (2.39 ± 1.73) compared with a healthy group (1.24 ± 0.92), with a significant value *P* = 0.001, according to Table 1. In Table 2, a significant value was shown in the mean differences of human IL-6 according to age among patients, where the flowing patients younger than 30 years had a mean (2.04 ± 1.66), while those greater than or equal to 30 years (3.30 ± 1.62). While there is no significant *P* = 0.174 relationship between IL and IR, as shown in Table 3.

PCOS can cause adipose-related health issues such as type 2 diabetes, metabolic syndrome, obesity, and IR. Additionally, cardiovascular disease, atherosclerosis, and high blood pressure are also more common in PCOS patients. Patients with PCOS frequently have obesity, and visceral obesity in particular, with prevalence rates ranging from 38% to 88%.^[12] Obesity is a metabolic condition marked by chronic inflammation and high levels of pro-inflammatory cytokines, chemokines, and

Table 1: The average variations of human interleukin-6 by research group (N = 80)

Study variable	Study group	N	Mean $\pm$ SD	P-value
Human interleukin-6 (pg/mL)	Polycystic ovarian syndrome	40	2.39 ± 1.73	<0.001*
	Control group	40	1.24 ± 0.92	

*P value ≤ 0.05 was significant

Table 2: The average variations of human interleukin-6 (pg/mL) according to age among patients with polycystic ovarian syndrome and insulin resistance (N = 40)

Study markers	Age (years)	N	Mean ± SD	P-value
Human interleukin-6 (pg/mL)	<30	29	2.04 ± 1.66	0.038*
	≥30	11	3.30 ± 1.62	

*P value ≤ 0.05 was significant

Table 3: The correlation of human interleukin-6 and insulin resistance among patients with polycystic ovarian syndrome and insulin resistance (HOMA-IR) (N = 40)

Study markers	Insulin resistance (HOMA-IR)	P-value
	R	
Human interleukin-6 (pg/mL)	0.219	0.174

oxidative stress (OS) indicators.^[13] This inflammatory process has been linked to obesity-related comorbidities such as endothelial dysfunction, atherosclerosis, and coronary heart disease. IL-6 has long been thought to be a major pro-inflammatory factor.^[14]

The findings of this study concur with those of numerous other studies, including a study by Peng *et al.*,^[15] which of 1618 females (922 PCOS sufferers and 696 non-PCOS controls) from 20 papers and 25 case-control studies. Controls had considerably lower levels of IL-6 than those with PCOS (SMD = 0.78, 95% CI = 0.41–1.16, $P < 0.001$), and there was high interstudy heterogeneity ($I^2 = 91\%$ and $P < 0.001$) in this finding.

In addition, in their meta-analysis, Escobar-Morreale *et al.*^[16] discover no connection between PCOS and IL-6 levels, whereas the results of two investigations conducted in Taiwan and India support those of the current study, and a strong link between IL-6 and PCOS has been observed.^[17] IL-6 levels in PCOS women were found to be considerably higher than in controls, according to a different Saudi Arabian study. In the PCOS group, obese women had greater plasma levels of IL-6 than did women of normal weight. Based on the separation of patients into two categories based on central obesity cutoff values.^[18]

The difference between the current study and previous studies is that it focused on patients with PCOS and IR.

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Conflicts of interest

There are no conflicts of interest.

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