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**Jassim Mohammed Ali**  
 College of Pure Science,  
 University of Kirkuk, Kirkuk,  
 Iraq

## Evaluation of the level of irisin, chemerin, and sex hormones in women with polycystic ovary syndrome

**Jassim Mohammed Ali**

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### Abstract

The research involve the collection of 70 samples, 40 samples from patients with polycystic ovary syndrome and 30 samples from healthy women, whose ages ranged between (20-45) years. After that, blood was collected from healthy and sick women, and it was separated by a centrifuge, and the parameters of the study were measured, including (Irisin, chemerin, glucose, FSH, luteinizing hormone, LH, and Prolactin). Sonar rays and analyzes of the patient's sex hormones were relied upon for the purpose of diagnosis and confirmation of polycystic ovary syndrome.

The results of the current research appears a significant elevated of (Irisin, chemerin, glucose, and Prolactin) level in the blood serums of women with PCOS among to healthy women, at a level of probability  $P \leq 0.001$ . The results of the current research also appears a significant reduce in each of the Serum (FSH, LH) levels of women with PCOS compared to healthy women.

**Keywords:** PCOS, irisin, chemerin, Sex hormone

### Introduction

Polycystic ovary syndrome is the most common endocrine disorder. It is a heterogeneous, but complex disorder that affects women in their childbearing years. It is also considered one of the most common causes of infertility due to the absence of ovulation and different endocrine glands that affect women. The causes of PCOS are still unknown. Known <sup>[1]</sup>. PCOS is associated with obesity in the abdomen and pelvis, insulin resistance and metabolic disorders, as its main symptoms are high androgen levels, ovarian dysfunction, and a high level of luteinizing hormone as a result of an increase in the pituitary gland's secretion of gonadotropin-releasing hormone, in addition to that, the percentage of women affected by the syndrome Polycystic cysts occur in approximately 6-10% of women worldwide, and symptoms of this syndrome appear during the teenage years and early adulthood <sup>[2-3]</sup>.

The appearance of hair in the body in abundance, or what is called hirsutism or hirsutism, infertility, the presence of cysts above the ovaries, and obesity are among the characteristic signs of the disease <sup>[4]</sup>. As the outer layer of the ovary sticks together and thickens in this area, preventing the mature egg from coming out of the hollow of the ovary. Without the release of this egg, the pregnancy process does not take place <sup>[5]</sup>, in addition to that, the size of the ovary will increase and its size will swell, and it may double. From its normal size, there is also an increase in the concentration of ovarian tissue around the cysts <sup>[6]</sup>.

Irisin is a novel cytokine secreted mainly by skeletal muscle after exercise that increases adipose tissue energy expenditure <sup>[7-8]</sup>. It also participates in glucose absorption and glycogenolysis by inhibiting glucose formation, lipid formation, and accumulation, and it is likely to have positive effects on glucose balance and insulin sensitivity. Therefore, irisin has become a potential target for the treatment of metabolic diseases. Polycystic syndrome due to its high concentration in the body <sup>[10, 9]</sup>.

Chemerin is considered one of the adipokines, which consists of 163 amino acids, and it is activated by the serine protease enzyme to form active chemerin <sup>[11]</sup>, that the high level of chemerin is associated with many inflammatory diseases, including chronic pancreatitis, ulcerative colitis, liver patients, in addition to polycystic ovarian syndrome <sup>[12]</sup>. As the chemerin hormone increases in concentration in patients with polycystic syndrome <sup>[13]</sup>.

Many symptoms are associated with polycystic ovary syndrome, as high glucose and insulin resistance are common symptoms of polycystic ovary syndrome. In this case, insulin

**Corresponding Author:**  
**Jassim Mohammed Ali**  
 College of Pure Science,  
 University of Kirkuk, Kirkuk,  
 Iraq

receptors become insensitive to this hormone, which requires instructing the pancreas to secrete more insulin to compensate for the lack of effectiveness [14]. The LH hormone plays an important role in the reproductive process of the female and the male. In males, it activates the Leydig cells present in the environmental cells of the testis responsible for the secretion of the testicular lipid hormone. In females, it is directly responsible for inducing the ovulation process in the ovary after the follicles mature [15]. Many symptoms are associated with polycystic ovary syndrome, as high glucose and insulin resistance are common symptoms of polycystic ovary syndrome. In this case, insulin receptors become insensitive to this hormone, which requires instructing the pancreas to secrete more insulin to compensate for the lack of effectiveness [14]. The LH hormone plays an important role in the reproductive process of the female and the male. In males, it activates the Leydig cells present in the environmental cells of the testis responsible for the secretion of the testicular lipid hormone. In females, it is directly responsible for inducing the ovulation process in the ovary after the follicles mature [15]. The level of the LH hormone rises in women in menopause or due to interruption of the menstrual cycle caused by polycystic ovary syndrome or primary failure of the ovary, while the level of the LH hormone decreases in cases of ovarian tumors or treatment with estrogen or the adrenal glands that secrete estrogen or progesterone. LH is necessary to detect ovulation [16].

The hormone prolactin is sometimes classified as a gonadotropin, as its blood levels are normally elevated in women with polycystic ovary syndrome [17]. As the increase in the secretion of the hormone prolactin in the blood is the result of the disorder that occurs in the anterior lobe of the pituitary gland, which leads to an increase in the level of prolactin in the blood, and this rise leads to inhibition of the secretion of the reproductive pituitary gland and thus causes a disturbance in the ovulation process [18].

Through the rise of the hormone irisin and chemerin with polycystic ovary syndrome, the current research aimed to study the effect of the hormone irisin and chemerin with some variables in women with PCOS.

## Material and Methods

### Collection of specimens

The study was conducted on 70 blood samples, and the samples were divided into two groups:

- 40 blood samples from patients with polycystic ovary syndrome.
- 30 blood samples of healthy women as a control group.

The ages of the two groups ranged between (20-45) years, and the samples were collected from the external medical laboratories of the radiology and sonar units in the city of Kirkuk for the period from 15/10/2022 - 1/1/2023, where the samples were collected by drawing venous blood from the (second) day - the third of two menstrual cycles).

### Blood collection

5 cm<sup>3</sup> of venous blood was withdrawn by using syringes, and the blood was placed directly in special test tubes and left for (20) minutes at room temperature for the purpose of blood coagulation, after which it was placed in a centrifuge for (15) minutes at a rate of (3000 cycles/min). The blood serum free from red blood cells was separated quickly to ensure that enzymes did not leak from the red blood cells) and the serum was frozen after its fractionation in several test tubes to perform the required biochemical examinations.

### Estimation of hormone levels in blood serum

The levels of each of (irisin, chemerin, FSH, LH, prolactin) in blood serum were estimated using the ELISA test using the measurement kit for each hormone and the ELISA system according to the manufacturer Monobind Inc, USA.

### Estimation of glucose level in blood serum

The glucose level in the sera was measured using the enzyme method, using the assay kit prepared by the Spanish company Bio Systems, according to the researcher's method [19].

### Statistical Analysis

The results were analyzed using the SPSS statistical program, and the average and the standard deviation value  $\pm$  SD were determined, as well as the averages were determined for the group of women with polycystic syndrome and the control group using the T-test and at the level of probability ( $P \leq 0.001$ ).

## Result and Desiccation

### Estimation of biochemical parameters for the samples under study

**Table 1:** appears the mean  $\pm$  S.D of the biochemical variables for the samples under study

Groups Parameter	Mean $\pm$ SD		P-Value
	Control n=35	PCOS n=35	
Irisin (ng/ml)	317.31 $\pm$ 112.01	425.45 $\pm$ 135.12	$P \leq 0.001$
Chemerin (pg/ml)	2.028 $\pm$ 0.875	10.23 $\pm$ 0.734	$P \leq 0.001$
Glucose (mg/dl)	86.76 $\pm$ 22.01	118.67 $\pm$ 29.78	$P \leq 0.001$
FSH (ng/ml)	869.54 $\pm$ 99.85	214.79 $\pm$ 102.08	$P \leq 0.001$
PRL (ng/ml)	198.25 $\pm$ 51.14	598.11 $\pm$ 198.18	$P \leq 0.001$
LH (ng/ml)	59.98 $\pm$ 19.15	12.19 $\pm$ 8.11	$P \leq 0.001$

The results appear a significant elevated at the level of  $p \leq 0.001$  in the level of each of (irisin, chemerin, glucose, prolactin,) in the serum of the group of patients with polycystic syndrome compared to the control group, as in

Figures (1, 2, 4, 3). Respectively. It also showed a significant decrease in (FSH, LH) hormones in the group of patients with polycystic syndrome compared to the healthy group, as shown in Figures (6, 5), respectively.

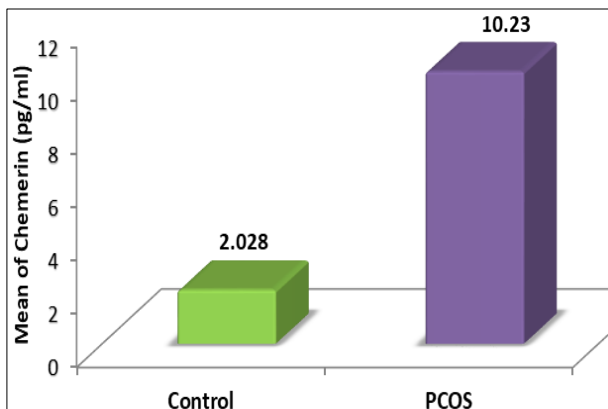


Fig 1: chemerin in the serums of the samples under study

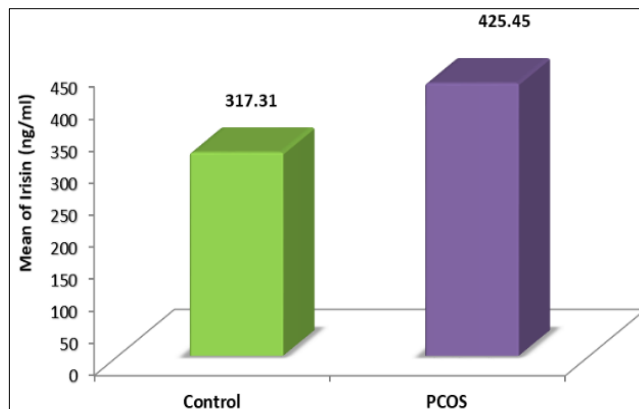


Fig 2: Irisin in the serums of the samples under study

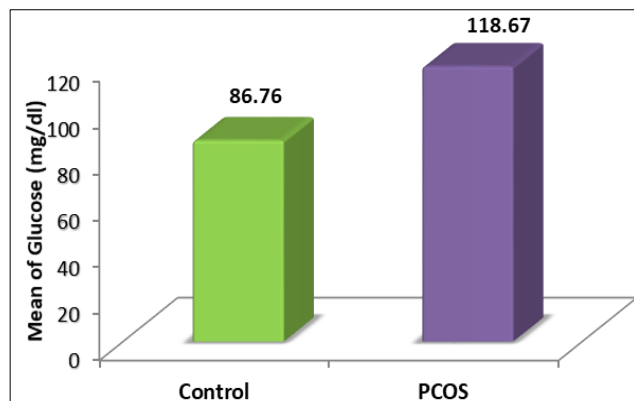


Fig 3: Glucose in the serums of the samples under study

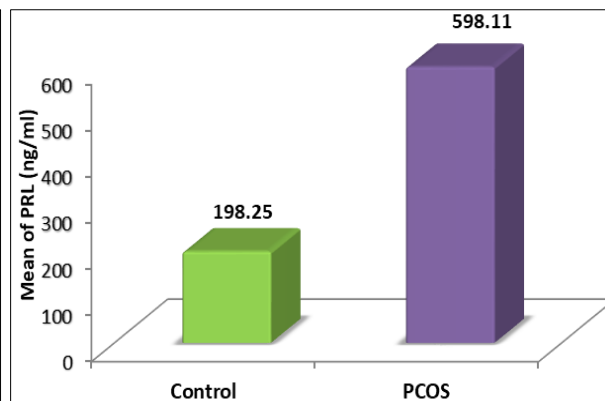


Fig 4: PRL in the serums of the samples under study

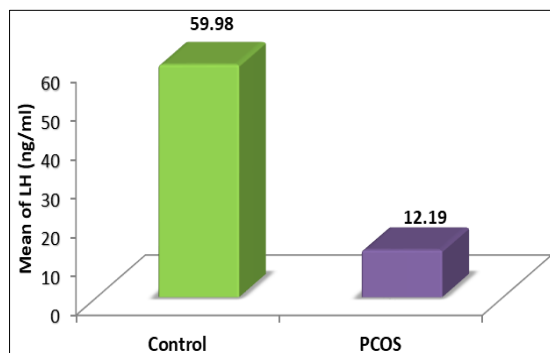


Fig 5: LH in the serums of the samples under study

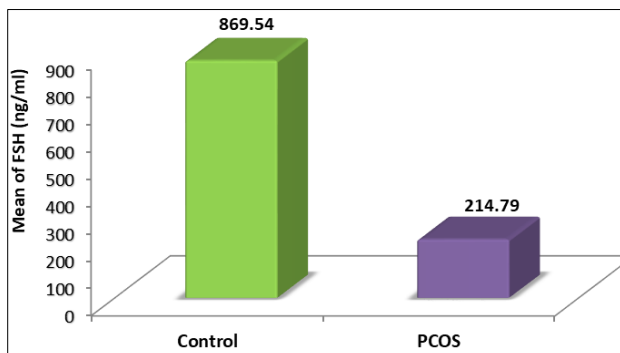


Fig 6: FSH in the serums of the samples under study

## Dissection

Diagnosis of PCOS depends on a set of different clinical phenotypes in each patient, as irisin is one of the proteins associated with insulin resistance and metabolic syndrome, which relies on it in the diagnosis of PCOS. The results agreed with the results of Ibrahim<sup>[20]</sup> (Bostancı,<sup>[21]</sup> (Adamska)<sup>[22]</sup>.

The reason for the increase in the level of the hormone irisin in the serum of patients with polycystic ovaries compared with the healthy group is that irisin is considered a resistance case similar to insulin resistance, where high levels of the circulating hormone fail to produce the desired physiological effect in patients with polycystic ovary syndrome, as it works as a preventive mechanism to address Excess energy influx, because the hormone irisin normally increases energy expenditure in brown adipose tissue and its elevated blood level is protective in pre-diabetic patients from PCOS<sup>[24, 23]</sup>. In addition, irisin may play a role in the pathophysiology of a number of diseases characterized by

insulin resistance, such as metabolic syndromes and type 2 diabetes, as higher levels of irisin are associated with body mass index (BMI), muscle mass, and adipose tissue mass<sup>[25, 26]</sup>. Also, its high concentration in the plasma is associated with cases of polycystic ovary syndrome, which is related to the fat content in the body. Exercise has a beneficial effect on its metabolism by activating the action of insulin, due to the increased secretion of a substance<sup>[27-28]</sup>.

In addition, the chemerin hormone showed a significant rise in the serum of polycystic patients compared with the control group, as the results of agree with (Jassim,<sup>[29]</sup> and (Falah)<sup>[30]</sup>. The reason for the rise is that chemerin reduces the expression of insulin-induced glucose transport protein activity across the total cell wall from the cytoplasm to the membrane, and the use of chemerin may impair glucose uptake<sup>[31]</sup>.

Moreover, chemerin plays a key role as a negative regulator in FSH-induced follicular steroidogenesis, which may be involved in the pathogenesis of polycystic ovaries<sup>[32]</sup>.

Chemerin, a recently discovered lipid, regulates adipocyte differentiation and controls the expression of adipocyte genes that regulate glucose and lipid homeostasis [33].

In addition, glucose showed a significant elevated in the serum of patients with polycystic ovaries compared with the healthy women. The results agreed (Ali) [34], and (Hussain) [35]. The reason for the rise in the level of glucose is due to a defect in the secretion of the hormone insulin, and this is an indication of the presence of insulin resistance, which is directly related to the high level of glucose in the blood, as the defect in the action of the hormone insulin in women with polycystic syndrome has a limited effect on the metabolic process of blood glucose [36].

Glucose is the main source of energy for the living cell, which is released inside the body through the decomposition of liver glycogen through the process of dissolution of glycogen as an internal source of glucose, causing an increase in the hormone insulin. Immature follicles [38, 37]. It has been proven that reducing insulin in patients with the syndrome leads to a decrease in the proportion of the androgen hormone in the patients' blood, and that many of the complications of the syndrome are associated with insulin resistance [39].

As for the hormone stimulating the growth of follicles (FSH), it showed a significant decrease in the serum of PCOS patients compared to the healthy group, as the results do not agree with (Awwad) [40] and (Baqer) [41].

And those who showed in their studies a high level of FSH hormone in the serum of patients with polycystic syndrome compared with the healthy women, as the reason for the decrease is due to hormonal disorders that lead to the non-occurrence of ovulation, as well as chromosomal defects and adrenaline gland imbalances in addition to autoimmune disorders because The FSH hormone works to stimulate the growth of eggs when its level is increased above the normal level and thus causes a failure in the ovarian function through its relationship with the estrogen hormone through a feedback mechanism, as the pituitary gland secretes high amounts of the FSH hormone in women with (PCOS) [42].

As for the prolactin hormone, it showed a significant rise in the serum of patients with polycystic syndrome, compared with control women, as the results agree with (Ahmed) [43], and (Hameed) [44], as the reason for the high The prolactin hormone leads to a change in the hypothalamic-pituitary axis, which increases its effect on the secretion of other sex hormones [45].

In addition, the increase in the level of the prolactin hormone causes inhibition of the production of FSH and the gonadotropin-releasing hormone (GnRH), which leads to a decrease in the level of estradiol in women and testosterone in men [46]. Also, the use of medical treatments that increase the level of the prolactin hormone in the blood may increase the concentration of the milk hormone from the normal level in PCOS patients, in order to increase the secretion of lactotrophs responsible for the production of the hormone from the anterior lobe of the pituitary gland, which leads to an increase in its secretion, and its increase is always associated with the secretion of milk. In women, which has been seen in some women with PCOS [47].

In addition, the LH hormone showed a significant reduce in the serum of patients with polycystic ovaries compared with the healthy group, as the results do not agree with (Mahdi) [48] and (Abdulwahid,) [49]. And those who showed in their studies an elevated in the level of the LH hormone in the

serum of patients with PCOS compared with the control group, as the reason for the decrease is due to the fact that the secretion of the hormone LH depends on the decrease in the hormone FSH, so the increase in the level of estrogen prevents the process of secreting the hormone LH and prevents the process from occurring Ovulation [50] When the luteinizing hormone does not reach the highest level on the 14th day of the menstrual cycle, ovulation does not take place, which causes the occurrence of an egg cyst in the ovary and delayed pregnancy and menstruation [51].

The luteinizing hormone plays an important role in the reproduction process for males and females. In males, the luteinizing hormone stimulates the process of spermatogenesis, as it stimulates the Leydig cells present in the environmental cells of the testis, which are secreted from the Sertoli cells responsible for the secretion of the male hormone. In females, it causes the ovulation process to occur in the ovary. After maturation of the follicles [52].

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