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Evaluation of the level of vitamin D and minerals in women with polycystic ovary syndrome in Samarra city

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Abstract

The study was conducted on 70 blood samples, which were divided into two parts:

• **Patient group:** 35 samples were from patients with polycystic ovary syndrome.

• **Control group (healthy women):** 35 samples were from healthy women (as a control group).

The ages of both groups ranged between (18-45) years for the period from 4/1/2024 - 6/1/2024. From Samarra General Hospital in Salah al-Din Governorate, blood was then collected from patients and healthy people and separated using a centrifuge. Then biochemical variables were measured, which included (glucose, LH, FSH, iron, magnesium, and vitamin D). The results of the current research showed a significant increase in each of the levels (glucose, LH, iron, and magnesium). In the blood serum of patients with polycystic ovary syndrome compared with the control group, there was a significant decrease in the level of (Vit D, FSH) in both groups at its level, probability $P \leq 0.001$.

Key words / PCOS, FSH, Glucose, LH, Iron, Magnesium.

Introduction

Gynecological diseases are one of the most complex topics in medical science, and the problems of pregnancy and menstruation are among the most important problems that women suffer from, as more than half of the world's women suffer from infertility and polycystic syndrome, which is considered one of the most important problems that hinder pregnancy [(1).] It is known as the most common endocrine disorder. As it affects the reproductive age group, women with this disease are characterized by an increase in the secretion of androgen and gonadotropin. It affects up to 13% of women of reproductive age and was originally called Stein-Levanthal syndrome [(2).]

Polycystic syndrome represents a complex, multifactorial disorder caused by some environmental factors in addition to genetic and hormonal background [(3).] It is characterized by chronic lack or absence of ovulation (anovulation, infertility, dysfunctional uterine bleeding, and an excess of androgens (hirsutism and acne), and the presence of polycystic ovaries [(4).] Polycystic ovary syndrome is associated with insulin resistance and obesity. Obesity, hyperinsulinemia, high blood pressure, and dyslipidemia [(5).]

Despite the diagnostic criteria, the medical and scientific understanding of the etiology of PCOS is still incomplete, even though it does include a complex mix of genetic, environmental, and genetic factors [(6).] Intrauterine growth in the mother may contribute to the appearance of PCOS features [(7).] Excessive secretion of androgens by theca cells and stromal cells of the

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polycystic ovary leads to the emergence of basic manifestations of the syndrome [8]. Hypersecretion of LH by the pituitary gland occurs as a result of disturbances in the ovarian response. The pituitary gland and excessive GnRH impulses from the hypothalamus also stimulate the secretion of testosterone by the ovaries, and a decrease in FSH levels occurs or they may remain constant and unchanged [9].

Insulin is considered a strong stimulator of the ovarian secretion of androgens, which occurs through a different insulin receptor that does not show insulin resistance. Therefore, insulin doubles the effect of the LH hormone and also doubles the degree of androgen excess by inhibiting the liver's production of the protein SHBG (a glycoprotein that binds most sex steroids), thus raising free androgens. Excessive body weight exacerbates underlying hormonal disorders (increased androgen and insulin levels) and clinical manifestations are evident in women with polycystic ovaries [10].

The treatment of polycystic ovary syndrome depends on the symptoms accompanying the patient. Sometimes oral contraceptives that contain estrogen and progesterone are the preferred medical treatment because they improve both menstrual disorders and androgen excess. Also, exercise is very important to reduce the diseases associated with obesity and insulin resistance [11].

Minerals are one of the most important groups of basic and necessary nutrients in the body, which include (Vitamins, essential fatty acids, and essential amino acids. Iron is one of the minerals that belong to the transition chain, and is considered an essential element for most living organisms, as it has an important vital role in transporting oxygen to Tissues, in addition to its important role in the mechanisms of vital oxidation within the living cell, iron also acts as a donor and acceptor of electrons, but this property makes it a toxic element in many cases. If it is present inside the cell freely, it reacts with hydrogen peroxide (H2O2) and turns it into free radicals, which may cause a lot of damage to cellular structures, causing cell damage or breakdown. Iron is one of the most essential minerals for the body's vital processes. Organism [12].

In addition, magnesium levels in the blood can be affected by polycystic ovary syndrome and environmental and genetic factors, as one of the genetic factors that affect Mg levels in the blood is primary familial Mg malabsorption. Environmental factors include alcoholism, therapeutic factors, diet, stress, and serious injuries. Or comprehensive surgery and various disorders such as gastrointestinal and kidney disorders [13].

As for vitamin D, it is considered one of the most important vitamins present in the body. This vitamin is obtained by exposure to sunlight for a sufficient period of time, as it can be considered a non-essential nutrient present in foods [14]. The most important thing that vitamin D does is to maintain a balanced calcium level in the blood. By enhancing its absorption in the intestine and maintaining the level of calcium and phosphate in the bone [15]. Low levels of vitamin D are evidence of many diseases, including osteomalacia in children, heart disease, weak immune system, diabetes mellitus, cancer, and polycystic syndrome [16]. Through the increase in glucose and iron levels, the current research aims to study the effect of the level of sex hormones and their relationship with some minerals in the blood serums of patients with polycystic ovary syndrome in the city of Samarra.

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Material and Methods

Study Samples: The study was conducted on 70 samples, 35 samples from patients with polycystic ovary syndrome and 35 samples from healthy people (as a control group), whose ages ranged between (18-45) years for the period from 4/1/2024 - 6/1/2024. From Samarra General Hospital in Salah al-Din Governorate, blood was then collected from patients and healthy people, after which blood was collected from patients and healthy people and was separated by a centrifuge, then the required biochemical variables were measured.

Collection of blood samples and preparation:

Were taken serum (5) ml of the drawn blood and put it in a plastic tube with a tight-fitting lid and free of anticoagulant (Plain tube) left at room temperature until the blood coagulates and then put in a centrifuge at a speed of (4000) rpm for (15) minutes The blood serum was kept at a temperature of (-20) C until use and biochemical analyses. The blood samples were transferred in a cool box to the laboratory for testing.

Estimation hormones level and minerals in blood serum

The examination of hormones, which included (LH, FSH, iron, magnesium, and vitamin D) is based on the competitive principle. When samples are added to the pits covered with antibodies to the hormones and minerals, the enzyme will compete with the antibodies to the hormones and minerals present in the samples to bind to the antibodies and the concentration of the enzyme associated with the pits decreases. As the concentration of hormones and minerals in the sample increases and the enzyme not bound to it is removed during the washing process, TMB solution is added and incubated for a specific period to produce a blue color change, after which the reaction is stopped by adding the stop solution and the absorbance of the samples is read at a wavelength of 450 nm. These hormones and minerals were measured in blood serum according to the manufacturer, Monobind Inc, USA. Using the ELISA test method, using a measuring kit for each measurement.

Estimation of glucose level in blood serum

The level of glucose in blood serum was measured by the Spanish company BioSystems, using an assay kit prepared using the enzymatic method followed by Young (2001) [17].

Statistical analysis:

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

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Results and discussion:

- **Measurement of the levels of biochemical variables for the samples under study:**

Table (1): shows the mean - standard deviation of the biochemical variables of the samples under study

Groups / Parameter	Mean ± SD		P-Value
	Control n=35	PCOS n=35	
Glucose (mg/dl)	101.8± 9.1	205.9± 33.8	P ≤ 0.001
LH(mIU/ml)	2.68±17.55	33.17 ±6.49	P ≤ 0.001
FSH(mIU/ml)	30.58 ± 4.98	17.27±3.95	P ≤ 0.001
Iron (mg/dl)	95.29±7.95	130.07±11.05	P ≤ 0.001
Mg (mg/dl)	2.01±0.75	2.97±0.98	P ≤ 0.001
Vit.D (ng/L)	32.49±9.92	15.24 ±3.415	P ≤ 0.001

The results showed a significant increase in each of the levels (LH, glucose, iron, magnesium) in the blood serum of patients with polycystic ovary syndrome compared to the control group, with a significant decrease in the level of (FSH, vitamin D) in both groups at its level, probability P ≤ 0.001. As in Figures (1,2,3,4,5,6) respectively.

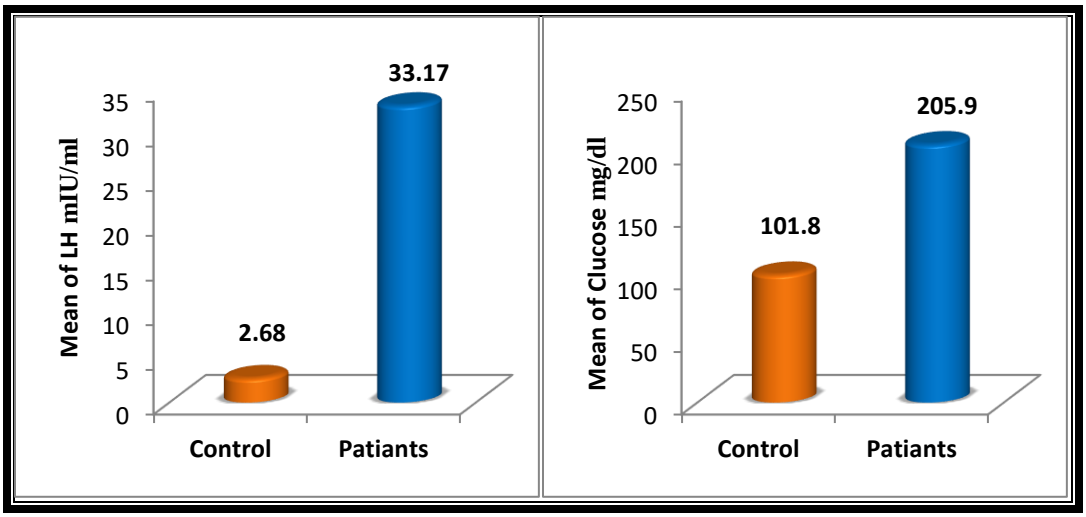

Figure 1: Clucose in the blood serum of the samples under study

Figure 2: LH in the blood serum of the samples under study

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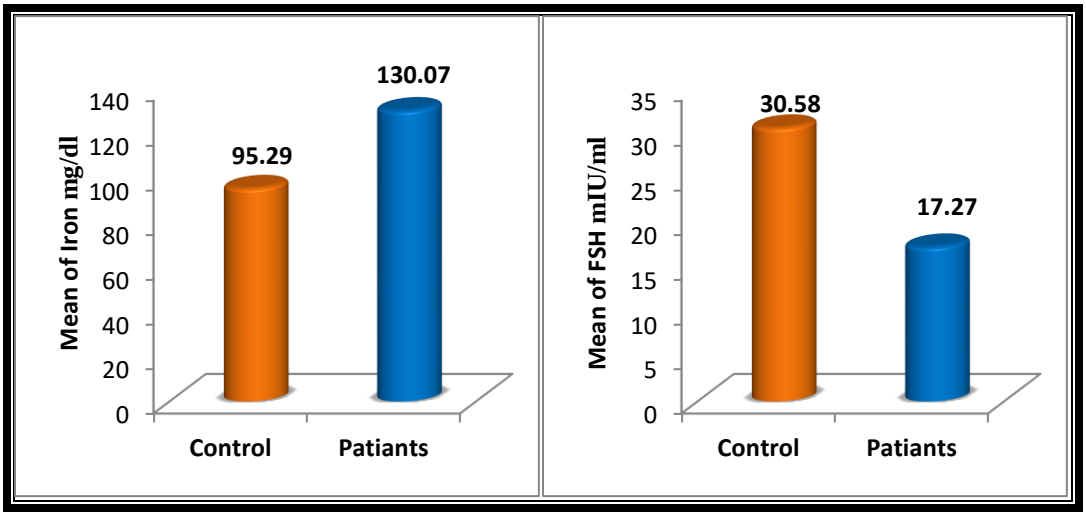

Figure 3: FSH in the blood serum of the samples under study

Figure 4: Iron in the blood serum of the samples under study

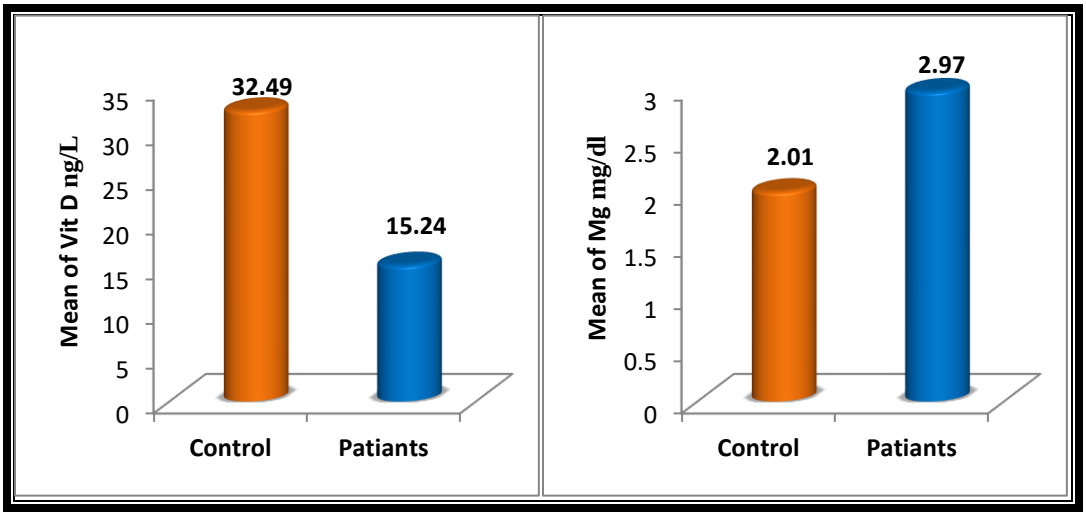

Figure 5: Mg in the blood serum of the samples under study

Figure 6: Vit D in the blood serum of the samples under study

Discussion

The continuous increase in the level of glucose leads to a defect in cellular functions and the occurrence of several diseases such as diabetes, obesity, and polycystic syndrome. The increase in the level of glucose may be due to the excessive secretion of the level of prolactin, which leads to the development of disorders in the metabolism of glucose and insulin. Patients with polycystic ovary syndrome commonly experience postprandial dysglycemia and an increased risk of developing type 2 diabetes, especially in obese women [18,19]. Morin-Papuner [20] indicated that increased secretion of glucose in the blood indicates a defect in the secretion of the hormone insulin, and this is an indication of the presence of insulin resistance, which is directly linked to a high level of glucose in the blood. It was also found that a defect in insulin action in women with the syndrome Polycystic ovary syndrome has a limited effect on blood glucose metabolism [21]. Insulin resistance in PCOS occurs

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due to impaired insulin action in various target tissues, which is characterized by primary compensatory hyperinsulinemia and decreased insulin response to hyperglycemia, as PCOS affects the majority of organ systems and tissues in the body [22].

As for the LH hormone, its results agreed with the results of a study [23,24] who indicated in their study that there was an increase in the level of luteinizing hormone in the blood serum of patients with polycystic ovary syndrome compared to healthy women, as the reason for the resulting increase is reinforced by the presence of an ovarian defect, and it may also occur. As a result of psychological stress or nutritional imbalance [25].

The results of (Taleb) [26] also indicated that women with polycystic ovary syndrome have an increase in the level of luteinizing hormone, as it was found that the most common clinical symptom in patients with polycystic ovary syndrome is an increase in the LH/FSH ratio, as the LH level is higher than the FSH level, which leads to To an increase in the rate, an increase in androgens in the ovary, and a failure in the ovulation process [27]. Therefore, an increase in the level of luteinizing hormone leads to a defect in the ovulation process or the absence of ovulation in the follicular cycle, as the luteinizing hormone stimulates ovulation and then stimulates the corpus luteum to form steroid hormones, but a high level of it suppresses the effectiveness of aromatase and inhibits the growth of the egg cell [28].

As for the FSH hormone, the results of his study do not agree with the results of (Salman) [29], who indicated in his study that there are no significant differences in the level of follicle-stimulating hormone in the blood serum of women with polycystic ovary syndrome. The slight decrease in the hormone level may be due to the high concentration of prolactin. It may inhibit the secretion of FSH [30]. Melmed et al [31] also indicated that the decrease in the hormone level may be due to the production of adrenaline from the adrenal gland, which in turn affects the concentration of FSH through the secretion of androgens.

As for the iron level, the results of his study agreed with the results of (Kamila) [32], which showed an increase in iron levels in women with PCOS syndrome compared to healthy women. Therefore, the reason for the increase in iron is due to the presence of iron in high quantities in various tissues and the irregularity of the menstrual cycle and loss of iron. Blood in women with polycystic ovary syndrome contributes to increased iron concentration and menopause compared to regular menstrual cycles in women (33). 80% of the iron in the body is bound to hemoglobin at low levels of this element, and non-independent hemoglobin is not manufactured in sufficient quantities, and the ability of red blood cells to carry oxygen is limited, which in turn leads to anemia. Many researchers have shown that the concentration of iron in the serum and body of patients High polycystic ovary syndrome [32].

As for magnesium, the results of his study agreed with the results of (Kamila) [32] and the results of his study (Maryam) [34], which indicated the presence of an increase in magnesium levels in women with polycystic ovary syndrome (PCOS), as a high concentration of magnesium in the blood can lead to polycystic ovary syndrome. Ovaries On the other hand, PCOS can also affect magnesium levels through poor blood sugar control. Diabetes is a risk factor for magnesium depletion [35]. Since diabetes is one of the consequences of PCOS, it can be said that PCOS is associated with a decrease in magnesium levels [36].

As for the level of vitamin D, its current results agreed with the results of both Ibrahim and his group [37] and Li and his group [38], who indicated in their study that there was a significant decrease in the level of vitamin D3 in patients with polycystic ovary syndrome compared with healthy women as a control group. The reason for the decrease in the level of

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vitamin D3 is due to malnutrition, dependence on fast food, as well as the lack of seafood on the table, and the lack of interest in health institutions in educating people about the importance of eating foods fortified with the vitamin, the importance of dietary diversity, and interest in eating foods rich in the vitamin, such as egg yolks, beef, liver, milk, and cheese, including The vitamin is a fat-soluble vitamin, so any factor that affects the absorption of fat in the intestine can affect the absorption of the vitamin [40,39].

3References

1- Francis, S.; Greenspan, M.D.; Facp.; David, G. *et al* Basic and Clinical Endocrinology 7th . edition. 2004; 314-320.

2- C. Ee, S. Pirotta, A. Mousa, L. Moran, and S. Lim, "Providing lifestyle advice to women with PCOS : an overview of practical issues affecting success," pp. 1–12, 2021.

3- Creatsas and E. Deligeoroglou, "Polycystic ovarian syndrome in adolescents," *Curr. Opin. Obstet. Gynecol.*, vol. 19, no. 5, pp. 420–426, 2023, doi: 10.1097/GCO.0b013e3282efdc54.

4- Jaripur, H. Ghasemi-Tehrani, G. Askari, M. Gholizadeh-Moghaddam, C. C. T. Clark, and M. H. Rouhani, "The effects of magnesium supplementation on abnormal uterine bleeding, alopecia, quality of life, and acne in women with polycystic ovary syndrome: a randomized clinical trial," *Reprod. Biol. Endocrinol.*, vol. 20, no. 1, pp. 1–11, 2022, doi: 10.1186/s12958-022-00982-7.

5- Kowalska, "Changes in Metabolic Profile in the Women with a History of PCOS — A Long-Term Follow-Up Study," 2020.

6- A. Wawrzkiewicz-Jałowiecka *et al.*, "In search of new therapeutics—molecular aspects of the pcos pathophysiology: Genetics, hormones, metabolism and beyond," *Int. J. Mol. Sci.*, vol. 21, no. 19, pp. 1–24, 2020, doi: 10.3390/ijms21197054.

7- K. Nahar, "Polycystic Ovary Syndrome in Teenage and Young Women," *J. Bangladesh Coll. Physicians Surg.*, vol. 37, no. 2, pp. 78–82, 2019, doi: 10.3329/jbcps.v37i2.40564.

8- S. Panchal and C. B. Nagori, "Sonographic Panorama of PCOS to explain its endocrinal orchestra," *Int. J. Hum. Reprod. Res. Dev.*, vol. 1, no. 1, pp. 27–38, 2021.

9- G. Bozdag, S. Mumusoglu, D. Zengin, E. Karabulut, and B. O. Yildiz, "The prevalence and phenotypic features of polycystic ovary syndrome: A systematic review and meta-Analysis," *Hum. Reprod.*, vol. 31, no. 12, pp. 2841–2855, 2016, doi: 10.1093/humrep/dew218.

10- L. Ss, H. Sk, V. R. E, N. Rj, T. Hj, and M. Lj, "Lifestyle changes in women with polycystic ovary syndrome (Review)," 2019, doi: 10.1002/14651858.CD007506.pub4.www.cochranelibrary.com.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 8, 2024

11- Sohail, R.; Islam , N.; Zaman, F. (2004) . Frequency of impaired glucose to lerance in polycystic ovarian disease . J. Surg Pakistan 9: 31- 3 .

12- Dev S, BABITT J.L. Overview of iron metabolism in health and disease. Hem. Int. 2017; 21: S6–S20.

13- Maedeh Babapour, Maedeh Babapour, Hamed Mohammadi, Maryam Kazemi, Amir Hadi, Mahsa Rezazadegan & Gholamreza Askari. Associations Between Serum Magnesium Concentrations and Polycystic .Ovary Syndrome Status: a Systematic Review.2021.

14- Whitney E . N , Cataldo C.P and Rolfes S.R Understanding normal and clinical nutrition , . (2002)6th edition , pp
363, 364 , 366, 404 , 406 , 407.

15- Yahav, S.; Buffenstein, R . Cholecalciferol supplementation alters gut function and improves digestibility in an underground inhabitant, the naked mole rat (Heterocephalusglaber), when fed on a carrot diet. The Bri. J. nutrition . 1993; 69 (1): 233– 41.

16- Holick MF. Vitamin D deficiency. N Engl J Med. 2007;357:266–281.

17-Young, D. S., & Friedman, R. B. (2001). Effects of disease on clinical laboratory tests (Vol. 1). Amer Assn for Clinical Chemistry.2001.

18- Kakoly, N. S.; Khomami, M. B. and Joham, A. E. Ethnicity, obesity and the prevalence of impaired glucose tolerance and type 2 diabetes in PCOS: a systematic review and meta-regression. Human reproduction update.2018; 24(4): 455-467.

19- Rosenfield, R. L. and Ehrmann, D. A. The pathogenesis of polycystic ovary syndrome (PCOS): the hypothesis of PCOS as functional ovarian hyperandrogenism revisited. Endocrine reviews.2016: 37(5): 467-520.

20- Morin-Papuner, L.C.;Vauhkonen, I.; Koivunen, R.M.; Ruokonen, A. and Tapanainen, J.S .Insulin sensitivity, insulin secretion, and metabolic and parameters in healthy women and women with polycystic ovarian syndrome. Ilum Reprod. 2000; 15:1266 1274.

21- Dunaif, A. Hyperandrogenic anovulation (PCOS): a unique disorder of insulin action associated with an increased risk of non-insulin-dependent diabetes mellitus. The American J of medicine.1995; 98(1): 33-39.

22- E. Diamanti-Kandarakis and A. Dunaif, “Insulin resistance and the polycystic ovary syndrome revisited: An update on mechanisms and implications,” *Endocr. Rev.*, vol. 33, no. 6, pp. 981–1030, 2012, doi: 10.1210/er.2011-1034.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 8, 2024

23- Hussein, Riam Ali. Evaluation of some hormones and biochemical variables in the blood of women with polycystic ovary syndrome in the city of Baghdad. Master's thesis. Tikrit University. Faculty of Science. Department of Chemistry. 2021.

24- Jadav, P. M. (2020). A study of Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH) in women of Polycystic Ovarian Disease (PCOD) at Tertiary Care Hospital of Gujarat, India. International Journal of Clinical Biochemistry and Research, 5(1), 112–115. https://doi.org/10.18231/2394-6377.2018.0022

25- Hasani, "Glucose transporters in adipose tissue, liver, and skeletal muscle in metabolic health and disease," *Pflugers Arch. Eur. J. Physiol.*, vol. 472, no. 9, pp. 1273–1298, 2020, doi: 10.1007/s00424-020-02417-x.

26- Talib, Zahraa Rasoul. Evaluating the relationship of some metabolic biomarkers and lead with hormonal changes in women with polycystic ovary syndrome. Master's thesis. University of Karbala. College of Science. 2022.

27- N. A. Malini and K. Roy George, "Evaluation of different ranges of LH:FSH ratios in polycystic ovarian syndrome (PCOS) – Clinical based case control study," Gen. Comp. Endocrinol., vol. 260, pp. 51–57, 2018, doi: 10.1016/j.ygcen.2017.12.007.

28- AL-Jaripur, H. Ghasemi-Tehrani, G. Askari, M. Gholizadeh-Moghaddam, C. C. T. Clark, and M. H. Rouhani, "The effects of magnesium supplementation on abnormal uterine bleeding, alopecia, quality of life, and acne in women with polycystic ovary syndrome: a randomized clinical trial," *Reprod. Biol. Endocrinol.*, vol. 20, no. 1, pp. 1–11, 2022, doi: 10.1186/s12958-022-00982-7.

29- Salman, Nour Younis. The effect of polycystic ovary syndrome on some biochemical variables and the oxidative stress balance among some affected women in the city of Samarra. Master's thesis. College of Education. 2022.

30- Eldar-Geva, T.; Spitz, I. M.; Groome, N. P.; Margalioth, E. J. and Homburg, R. Follistatin and activin A serum concentrations in obese and non-obese patients with polycystic ovary syndrome. Human reproduction.2001; 16(12): 2552-56.

31- Melmed, S. and Jameson, L. In Harrison principes of internal medicin. New York Mc Graw Hill Professional.2004.

32- Kamila Pokorska-Niewiada, Agnieszka Brodowska, Jacek Brodowski and Małgorzata Szczuko (2022). Levels of Trace Elements in Erythrocytes as Endocrine Disruptors in Obese and Nonobese Women with Polycystic Ovary Syndrome, Int. J. Environ. Res. Public Health., 19, 976.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 8, 2024

33- Mowafaq, Yasser Ahmed and Omar, Hala Wathiq (2021) Study of some biochemical variables in the sera of patients with polycystic ovary syndrome in Tikrit, Journal of Educational and Scientific Studies - College of Education- Iraqi University, 5, No. 17.

34- Maryam Kanafchian, Sedigheh Esmaeilzadeh, Soleiman Mahjoub Maryam Rahsepar & Maryam Ghasemi, (2019). Status of Serum Copper, Magnesium, and Total Antioxidant Capacity in Patients with Polycystic Ovary Syndrome, Biological Trace Element Research, 193, pages111-117.

35- Levin G, Mather H, Pilkington T (1981). Tissue magnesium status in diabetes mellitus. Diabetologia 21(2):131-134.

37- Asemi Z, Esmaillzadeh A (2015) DASH diet, insulin resistance, and serum hs- CRP in polycystic ovary syndrome: a randomized controlled clinical trial. Horm Metab Res 47(03):232-238.

37- Ibrahim, Z. M., Kishk, E. A., Fahmy, S. M., & Taha, O. T. (2020). Serum 1, 25-dihydroxy vitamin D-vitamin D3-among obese Egyptian women with polycystic ovary syndrome. Obstet Gynecol, 4, 1-3.

38- Li, Y., Wang, J., Yang, J., Chen, J., Zhou, W., Qiao, C., ... & Bi, Y. (2021). The correlation between vitamin D, glucose homeostasis and androgen level among polycystic ovary syndrome patients: A cross-sectional study. Gynecological Endocrinology, 37(3), 235-239.

39- Holick H. L. Biochemistry and physiology-Aspect of Nutrition. 4th Ed. Mosbey 2004.

40- Jhon, G.R. competitive protein binding redio assay for 25(OH) D3. J.Clin. Endocr.Metab.1971;33:992-5.