Pro Index | Journal of Science in Medicine and Life

Volume: 2 Issue: 11 Year: 2024
ISSN: 2992-9202 | http://journals.proindex.uz

Physiological Evaluation of Some Fertility Hormones for Women with Polycystic Ovary Syndrome in Wasit Province

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Abstract: Polycystic ovary syndrome (PCOS) is the most common metabolic and endocrine disturbance affecting about (15%) of female in reproductive age, it is the most common causes of infertility, recognized by hirsutism, anovulation problems and hyperandrogenemia problems.

The aim of this study was to estimate the concentration of serum luteinizing hormone LH, follicle stimulating hormone FSH, LH/FSH Ratio, testosterone, dehydroepiandrosterone sulfate DHEA-S , and serum prolactin hormones for women diagnosed with PCOS and healthy women of the control group.

The role of this study included 70 women in reproductive age diagnosed with PCOS, were divided into two groups; 40 married women (57.14%) and 30 unmarried women (42.85%), age range (18-45) years, this study was done in Al-Zahraa Teaching Hospital, AL Kut city, Wasit province, from January, 2024 to may, 2024. While, the control subject included 50 women with regular menstrual cycle and with no any hormonal problems, the control individuals were closely as the same ages as the patients group.

The obtained results indicated that the concentrations of serum LH, LH/FSH Ratio, testosterone hormone, and dehydroepiandrosterone sulfate significantly elevated ($p \leq 0.05$) in women with (PCOS) compered with control groups for all age ranges. On the other hand , no significant variations ($P > 0.05$) were notice in the mean values of serum follicle stimulating hormone between polycystic ovarian syndrome women group and control group in all age ranges. While, serum prolactin hormone considerably significant increased ($p \leq 0.05$) in married women having (PCOS) as compered with control subjects. Whereas, no significant variations ($p > 0.05$) were recorded in serum prolactin level in unmarried women having (PCOS) than in control group for all age ranges.

Conclusion: This study concluded that there were elevated levels in all hormones including serum LH, LH/FSH Ratio, testosterone hormone, and (DHEA-S) were found in patients women having polycystic ovarian syndrome as compered with control groups for all age ranges, except the level of follicle stimulating hormone was showed no significant differences than in control group. Also, an increase in these hormone levels may be associated with increased serum prolactin hormone in married women which may be an important indicator for increase the infertility for women having PCOS.

Key Words: Polycystic ovary syndrome, LH, FSH, LH/FSH Ratio, and (DHEA-S).

Introduction

Polycystic ovary syndrome PCOS is the most prevalent metabolic and endocrine disturbance affecting about (15%) of women in childbearing age globally; it is the most common causes of infertility, recognized by hirsutism, anovulation problems and hyperandrogenemia problems (Xu *et al.*, 2022; Teede *et al.*, 2010). The main symptoms of PCOS include menstrual disturbances, androgen excess, hirsutism, patches of thickened skin, and difficulties achieving pregnancy (Riestenberg *et al.,* 2022).

PCOS primarily characterized by androgen excess and ovulatory dysfunction. According to diagnostic criteria, the disorder affects about 6% to 20% of women in reproductive aged (Escobar, 2018; Azziz *et al*., 2016), appropriate examination for morbidities included symptoms, clinical screening, and family risk factor, followed by suitable management to avoid further development of disease (Teede *et al*., 2018; Styne *et al*., 2017; Legro *et al*., 2013). Furthermore, polycystic ovarian syndrome is the reason of interactions between many genes and proteins which affected by many environmental factors. So, polycystic ovarian syndrome pathogenesis is one of metabolic dysfunctions play a vital role in the pathophysiology in female during reproductive age (Liao *et al.,* 2021). Thus, insulin resistance is the leading cause of pathogenesis of polycystic ovarian syndrome (Aburawi *et al.,* 2021). Because glucose is not used for energy generation, it is retained in the body, leading to weight gain; in this case, people with insulin resistance may or may not go on to develop type 2 diabetes (Grajales *et al.,* 2019).

The hypothalamus, sensitive to circulating amounts of sex hormones, regulates LH with gonadotropin releasing hormone; LH binds to receptors on ovarian follicles, promoting ovarian follicle growth, ovulation and estrogen production in females (Bosch *et al.,* 2021). Increased levels of LH may be effects on the developing endometrium and oocyte, these effects caused by increased testosterone and estrogen concentration (Alam *et al.*, 2019). Any variations in follicle stimulating hormone levels may be caused an imbalance in the ovulation process, and this may be a sign of infertility or the onset of menopause (Alrawi and Al-Issa, 2022). Furthermore, dehydroepiandrosterone is an endogenous steroid hormone, and its metabolite is (DHEA-S), are the most affluent steroid hormones which released from cortex of adrenal gland , gonads, and brain (Tang *et al.,* 2021). About (20-30) % of female with PCOS suffering from immoderate excretion of adrenal androgens, such as DHEA-S. So, the possibility of adrenal androgens may be related to (PCOS) pathogenesis (Islam *et al.,* 2022).

Prolactin is one of multifunctional polypeptide secreted mainly from anterior pituitary gland and extra pituitary tissues such as the endometrium, decidua, breast, adipose tissue, and brain that is involved in numerous physiological and pathophysiological processes including lactation, homeostasis, immunity, luteal function, and reproduction (Ravi, 2014). Increase the levels of serum prolactin in both follicular and luteal phase may be associated with reduction of ovarian follicles and ovulation in PCOS patients (Vilar *et al.,* 2014). The presnt study was aimed to assess the levels of serum LH, FSH, LH/FSH Ratio, testosterone hormone, DHEA-S, and serum prolactin hormone and their relationship with fertility status in married and unmarried women having PCOS according to their age ranges.

Subjects and Methods

Study design

The current study was done during the period from January, 2024 to may, 2024 in Al-Zahraa Teaching Hospital in AL- Kut city, Wasit province, Iraq, this study consist of (70) women diagnosed with PCOS were dividing into two groups; 40 married women (57.14%) and 30 unmarried women (42.85%), age range (18-45) years. In addition, the control group included (50) healthy women with no childbearing problems or any other hormonal problems, age range from (18-45) years. Each of PCOS groups and control group were divided into three age ranges; The first age range (< 25), second age range (26-35), and the third age range (36-45).

Sampling

Five milliliters (5 ml) of venous blood were drawn from control subjects and patients women having polycystic ovarian syndrome (in follicular phase). the blood samples were transported into the disposable gel tube, left for (30) minutes at room temperature and then centrifuged at (3000) run per minute for (10) minutes, serum was placed in a sterile eppendorf tube and then kept at (-20)°C for measuring the levels of serum: luteinizing hormone, follicle stimulating hormone, testosterone hormone, dehydroepiandrosterone sulfate, and prolactin hormone.

Biochemical Analysis

The Cobas e 411 (Roche- Germany) was used to measure the levels of serum, LH, FSH, , total testosterone, and dehydroepiandrosterone sulfate; depending on kit assay Roche/Germany. While, prolactin level in the serum of all individuals was measured by (ELISA) technique, depending on kit assay Astra Biotech, Germany.

Statistical Analysis

Data of the present study were achieved by using statistical package for the social sciences (SPSS) program specifically version 23, by using ANOVA (one way analysis). The data were expressed as mean ± SD (standard deviation). LSD were used for comparison between PCOS group and control group. A level of (P value) less than (0.05) has been considered a significant.

Result

Results of the present study exhibit significant elevation ($p \leq 0.05$) in serum luteinizing hormone in married and unmarried women having PCOS in compression to control groups for all age ranges. while, non significant variations ($P > 0.05$) were detected between married and unmarried women with PCOS for all age range. (Table 1).

Table (1): The mean values of serum luteinizing hormone LH in women with polycystic ovarian syndrome and control subject according to age ranges.

Luteinizing Hormone (mIU/mL)			
age range (year)	**Control Group (No. 50)**	**PCOS Group (No. 70)**	
		married (No. 40)	**unmarried (No. 30)**
< 25	5.25+ 1.54 Aa	22.06 + 17.00 Ba	22.66 + 11.68 Ba
26-35	5.15 + 1.28 Aa	19.85 + 12.09 Ba	26.62 + 12.78 Ba
36-45	4.80 + 1.23 Aa	20.99 + 10.12 Ba	23.35 + 10.57 Ba

Data = Mean ± Standard Deviation

Diverse capital letters in the same row indicate to significant differences ($P \leq 0.05$).

Diverse small letters in the same column indicate to significant differences ($P \leq 0.05$)

Similar capital and small letters indicate to non-significant differences ($P > 0.05$).

while, the results exhibit no significant variation ($P > 0.05$) in serum follicle-stimulating hormone (FSH) between PCOS group and control group for all age ranges. Also, no significant variations ($P > 0.05$) were detected between both groups of PCOS (married and unmarried) women in all age ranges. (Table 2)

Table (2): The mean values of serum follicle stimulating hormone FSH in women with polycystic ovarian syndrome and control subject according to age ranges.

Follicle-stimulating hormone(mIU/mL)			
age range (year)	**Control Group (No. 50)**	**PCOS Group (No. 70)**	
		married (No. 40)	**unmarried (No. 30)**
< 25	7.30 + 1.17 Aa	6.19 + 2.17 Aa	6.57 + 1.48 Aa
26-35	6.77 + 1.43 Aa	5.10 + 1.67 Aa	7.20 + 2.77 Aa
36-45	6.21 + 1.44 Aa	7.20 + 2.77 Aa	5.76 + 2.57 Aa

Thus, the current results recorded statistically significant increases ($p \leq 0.05$) in the concentration of LH/ FSH ratio in both married and unmarried women having PCOS in compression to control groups in all age ranges; However, there were no significant variations ($P > 0.05$) in the level of LH/FSH ratio between (married and unmarried) women having PCOS for all age ranges. (Table 3)

Table (3): The mean values of serum LH/FSH Ratio in women with polycystic ovarian syndrome and control subject according to age ranges.

LH/FSH Ratio			
age range (year)	**Control Group (No. 50)**	**PCOS Group (No. 70)**	
		married (No. 40)	**unmarried (No. 30)**
< 25	0.67 + 0.21 Aa	2.06 + 1.68 Ba	2.72 + 1.88 Ba
26-35	0.80 + 0.30 Aa	2.68 + 2.34 Ba	3.10 + 1.73 Ba
36-45	0.94 + 0.28 Aa	3.60 + 1.14 Bb	2.60 + 1.58 Ba

(Tables 4) and (Tables 5) summarizes the mean values of serum testosterone and serum dehydroepiandrosterone sulfate (DHEA-S) in both study volunteers respectively, the current results exhibit significant elevated ($p \leq 0.05$) in serum testosterone and serum (DHEA-S) for both groups of (married and unmarried) women as compared with control groups in all age ranges. However, according to the age ranges the results of serum testosterone and serum (DHEA-S) recorded no significant variations ($P > 0.05$) within all age ranges in both control group and PCOS groups.

Table (4): The mean values of serum testosterone (ng/ml) in women with polycystic ovarian syndrome and control subject according to age ranges.

Testosterone (ng/ml)			
age range (year)	**Control Group (No. 50)**	**PCOS Group (No. 70)**	
		married (No. 40)	**unmarried (No. 30)**
< 25	0.50 + 0.19 Aa	1.37 + 0.60 Ba	1.42 + 0.84 Ba
26-35	0.17 + 0.06 Aa	1.16 + 0.89 Ba	1.49 + 0.81 Ba
36-45	0.23 + 0.15 Aa	1.64 + 0.58 Ba	1.53 + 0.72 Ba

Table (5): The mean values of serum dehydroepiandrosterone sulfate (DHEA-S) in women with polycystic ovarian syndrome and control subject according to age ranges.

Dehydroepiandrosterone sulfate (ng/ml)			
age range (year)	**Control Group (No. 50)**	**PCOS Group (No. 70)**	
		married (No. 40)	**unmarried (No. 30)**
< 25	151.70 + 66.77 Aa	249.70 + 63.70 Ba	279.70 + 65.41 Ba
26-35	133.30 + 63.45 Aa	242.80 + 71.35 Ba	277.30 + 51.18 Ba
36-45	132.80 + 49.27 Aa	245.90 + 68.66 Ba	275.60 + 54.91 Ba

The results indicated that serum prolactin hormone considerably significant increased ($p \leq 0.05$) in married women having (PCOS) than in control volunteers. Whereas, non significant differences were recorded in serum prolactin level in unmarried women than in control groups for all age ranges. Furthermore, serum prolactin hormone significantly increased ($p \leq 0.05$) in married women compared with unmarried women for all age ranges. However, according to the age ranges the

results of serum prolactin recorded no significant variations (P>0.05) within all age ranges in both control subject and PCOS groups. (Table 6)

Table (6): The mean values of serum prolactin hormone (ng/ml) in women with polycystic ovarian syndrome and control subject according to age ranges.

Prolactin (ng/ml)			
age range (year)	**Control Group (No. 50)**	**PCOS Group (No. 70)**	
		married (No. 40)	**unmarried (No. 30**
< 25	17.72 + 6.10 Aa	45.17 + 15.80 Ba	22.30 + 4.02 Aa
26-35	21.60 + 4.50 Aa	43.90 + 17.82 Ba	21.60 + 4.40 Aa
36-45	20.40 + 7.33 Aa	46.01 + 16.41 Ba	22.90 + 4.58 Aa

Discussion

The current study demonstrated a statistically significant increase in serum luteinizing hormone (LH) concentration (p≤0.05) in patients women having PCOS compared to the control volunteers. This finding aligns with Laven *et al*. (2002), who reported that serum LH levels elevated significantly in women with PCOS. Evidence suggests that high level of LH disrupts oocyte maturation and fertilization, ultimately leading to reduced pregnancy rates and increased miscarriage rates (Kumar and Sait, 2011). Other studies indicate that elevated endogenous LH levels adversely affect the quality of oocytes and embryos, as well as implantation and pregnancy outcomes (Mendoza *et al*., 2002). While, the data of current study recorded no significant difference in serum (FSH) level between (PCOS) women group and control volunteers, this finding was in consistent with study of (Temur *et al.,* 2017). Thus, poor egg growth and the inability to ovulate result from a combination of large amounts of LH hormone, contributing to high level of androgen and low level of FSH hormone. Inadequate levels of progesterone produced by the ovaries due to a lack of ovulation, which may be caused a woman's menstrual cycle to stop completely (Khmil *et al.,* 2020).

Otherwise, the level of LH/ FSH ratio significantly elevated (P≤ 0.05) in PCOS women than in the control volunteers, this is in line with Kurek Eken *et al*., (2019) who recorded that both LH and LH/ FSH ratios were elevated significantly in women having polycystic ovarian syndrome. An increased in the (LH/FSH ratio) suggest a hormonal disorders in polycystic ovarian syndrome patients, and this increase in (LH/FSH ratio) is a risk factor for PCOS because it indicates a strong ovulatory reserve (Kurek Eken *et al.,* 2019).

In addition, serum testosterone and Dehydroepiandrosterone sulfate significantly elevated in female with PCOS than in the control subjects (P≤ 0.05), this is consistent with a study Nada and Al-Wazzan who reported that PCOS women had a higher concentration of testosterone hormone which can lead to an imbalance in female hormones causing an irregular menstrual cycle (Nada and Al-Wazzan, 2021). Also, these results are in accordance with findings of Khan *et al*., (2021), who found a statistically significant elevation in serum (DHEA-S) in the proportion of polycystic ovarian syndrome women compared to control women. In addition, the results of current study showed significant increased in serum prolactin levels in married women having PCOS compared with control subjects, these results are in line with findings of Davoudi *et al*., (2021), who reported increased serum prolactin level in polycystic ovary syndrome patients. Also, Chaudhari *et al*., (2018), recorded that women with polycystic ovarian syndrome usually have higher production of gonadotropin releasing hormone which may be caused increase prolactin levels.

Conclusions: This study concluded that there were elevated levels in all hormones including serum LH, LH/FSH Ratio, testosterone hormone, and dehydroepiandrosterone sulfate in women with PCOS as compered with control subject for all age range, except the level of FSH values was showed no significant differences than in control group . Thus, an increased in these hormone may

be associated with increased level of serum prolactin hormone in married women and is an important indicator for increase the infertility in women with (PCOS).

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