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## **The role of FSH, LH, and Prolactin Hormones in Female Infertility**

**Ali A. Al-Fahham<sup>1\*</sup>, Hisham Q. Al-Nowainy<sup>1</sup>**

*1 University of Kufa, Faculty of Nursing , Basic Science Department*

### **ABSTRACT**

Recently, a great attention has been paid to the role of hormones as a diagnostic too in the evaluation of female infertility . The purpose of this study was to identify the association between female infertility and hormonal imbalance (FSH, LH and Prolactin) and what is the relationship between these hormones and the woman's socio- demographic and clinical characteristics. The study was carried out at the Fertility Center in Al-Sadr Medical City, which is located in Najaf province, Iraq, during the period from Dec, 2014 to Apr, 2015. The study involved (44) infertile women who attended the Fertility Center. In accordance to the socio-demographic data, the majority of the studies women were from urban regions (81.18%), while all them were housewives. The clinical history revealed a relatively high percentage (56.82%) of vaginitis, and UTI (50%) among the studies women, while most of them were either overweight (40.91%) or obese (22.73%). The results showed that the majority of studies women had normal hormonal levels according to the standard reference limits for FSH, LH and Prolactin. The study also showed that there was a significant positive correlation between the level of FSH and the age of the studies infertile women. It was concluded that hormonal imbalance for (LH, FSH and prolactin) is just a minor suspected etiologic factor in causing infertility in the studies women the level of FSH increases with age, while the level of prolactin slightly decreases with age. It was recommended to achieve a comprehensive case-control study for evaluating hormonal imbalance of (FSH, LH, prolactin, estrogens, progesterone, thyroid and inhibit) hormones in the infertile women.

\*Corresponding Author Email: [aliaz.mahdi@uokufa.edu.iq](mailto:aliaz.mahdi@uokufa.edu.iq)

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## INTRODUCTION

Infertility is a complex disorder with significant medical, psychosocial, and economic problems. Female infertility, male infertility or a combination of the two, affects millions of couples in the world each year. It is estimated that globally 60-80 million couples suffer from infertility every year (Pasi *et al.*, 2011)<sup>1</sup>.

The cause of female infertility can be difficult to diagnose, but many treatments are available. Numerous medical conditions can contribute to infertility. In fact, most cases of infertility are due to other medical conditions. These disorders can damage the fallopian tubes, interfere with ovulation, or cause hormonal complications. . Hormonal anomalies that affect ovulation include hyperthyroidism, hypothyroidism, and hyperprolactinemia (Kanagavalli *et al.*, 2013)<sup>2</sup>.

Several lifestyle factors may affect reproduction, including habits of diet, clothing, exercise, and the use of alcohol, tobacco, and recreational drugs. Exposure to textile dyes, lead, mercury and cadmium, volatile organic solvents and pesticides has been also associated with infertility (Agboola, 2004)<sup>3</sup>.

There is a complex association between sexual behavior and infertility. Sexual dysfunction can cause a delay in conception, but can also be the result of not conceiving. The greatest chance of conception is achieved through sexual intercourse on multiple occasions during the fertile period . Infertility may be the result of sexual problems. Therefore, infertility examination should include an evaluation of couple's sexual behavior (Tayebi, 2007)<sup>4</sup>.

Recently, hormonal disturbances have been considered of great importance in the knowledge of causes and diagnosis of female infertility. An increase in FSH in women may indicate a reduction in the production of good quality eggs and embryos for fertilization. a woman's chances for pregnancy may be lower than expected for her age. However, it does not mean she has no chance of conceiving. She may have more difficulty conceiving and may require infertility treatment. (Lee *et al.*, 2013)<sup>5</sup>.

LH is a hormone that is produced in the pituitary gland in both men and women. In women, LH is an important part of the menstrual cycle. It works in conjunction with follicle-stimulating hormone (FSH). The rise in estrogen tells the pituitary gland to stop producing FSH and to start making more LH. The shift to LH causes the egg to be released from the ovary, a process called ovulation .general, higher than normal levels of LH in a woman may mean the ovaries are absent or not functioning. In a young woman, high levels may mean that puberty is early Low levels of LH in

the blood may indicate anorexia, an issue in the pituitary gland, stress, or damage to the hypothalamus in both men and women. Mary (Nam *et al.*, 2012) <sup>6</sup>.

Prolactin plays an important role in the reproductive health of both women and men. Its main role, however, is to stimulate the production of milk in women after childbirth. In other words, prolactin triggers lactation. levels of prolactin have been found to be a measure of sexual satisfaction in both men and women (Lee *et al.*, 2013) <sup>5</sup>.

### **Objectives of the study.**

1. To determine the main hormonal disturbances in the hormones (FSH, LH. and prolactin) among infertile women.
2. To study the relationship between hormonal levels and each of socio- demographic and clinical characteristics.

## **MATERIALS AND METHOD**

A cross-sectional descriptive approach was designed to meet the previously mentioned objectives of the current study. The study was conducted from Dec. .2014 to Apr. 2015. In Al. Najaf City / Al-Sadr Medical City/ Infertility Center. A Convenience sample of (44) patients was taken in this study .

### **Data collection**

Data were collected by the interview technique with each woman as mean of data collection process. Some of the clinical data collected either with aid of the health staff members.

### **Hormonal tests**

The levels of serum Follicle stimulating hormone (FSH), Luteinizing hormone (LH), and prolactin were measured by using enzyme-Linked immune-sorbet assay (ELISA) methods (according to the kits from Biocheck, Inc.).

### **Statistical Analysis**

The analysis of data was performed by using a Megastat (Version 9.4 2005) computer program . Results were expressed as mean  $\pm$  standard deviation S.D . Independent unpaired student t-test was used to analyze the differences between groups. Pearson correlative – factor was used for measuring the correlations between indicators.

## **RESULTS AND DISCUSSION**

**Table 1: The distribution of patients according to the level of LH, FSH and prolactin hormones .**

Characteristic	Groups	Frequency (Total=44)	Percentage (%)
LH	Normal	24	54.54
	Borderline	11	25
	Abnormal	9	20.46
FSH	Normal	31	70.46
	Borderline	5	11.36
	Abnormal	8	18.18
Prolactin	Normal	36	81.82
	Borderline	0	0
	Abnormal	8	18.18

Table (1) shows the observed frequencies and percentage of the studied infertile women according to the level of LH, FSH and prolactin hormones. The percentages of normal levels were (54.54 %), (70.46 %) and (81.82 %), while abnormal levels were (20.46 %), (18.18 %) and (18.18 %) for LH, FSH and prolactin respectively.

**Table 2: The observed frequencies and percentage of the socio-demographic characteristics for the studied infertile women.**

Characteristic	Groups	Frequency (Total=44)	Percentage (%)
Age (years)	17-26	16	36.36
	27-36	18	40.91
	37-46	10	22.73
Residence	Rural	8	18.18
	Urban	36	81.82
Education	Illiterate	8	18.18
	Read and write	16	36.36
	Secondary	18	40.91
	College	2	4.55
Economic level	Higher studies	0	0
	Adequate	6	13.65
	Adequate for some extent	31	70.45
	Inadequate	7	15.9

Table (2) shows the observed frequencies and percentage of the socio-demographic characteristics for the studied infertile women including: age, residence, educational level and economic level. The majority of the patients are from urban regions (81.18%), while all the studies women were housewives

**Table 3: The observed frequencies and percentage of the clinical characteristics for the studied infertile women.**

Characteristic	Groups	Frequency (Total=44)	Percentage (%)
Duration of Infertility	1-5	20	45.46
	6-10	16	36.36

	11-15	8	18.18
Age at menarche	$\geq 12$	21	47.73
	$> 12$	23	52.27
BMI	Normal	16	36.36
	Overweight	18	40.91
	Obese	10	22.73
Polycystic ovarian disease	Present	15	34.09
	Absent	29	65.91
Vaginitis	Present	25	56.82
	Absent	19	43.18
UTI	Present	22	50
	Absent	22	50
Previous Laparoscopy	Present	9	20.45
	Absent	35	79.55

Table (3) reveals the observed frequencies and percentage of the clinical characteristics for the studied infertile women including: duration of infertility, age at menarche, body mass index (BMI), polycystic ovarian disease, vaginitis, urinary tract infection and previous laparoscopy. It shows a relatively high percentage (56.82%) of vaginitis, and UTI (50%) among the studies women, while most of them were either overweight (40.91%) or obese (22.73%) .

**Table 4: Correlation between (LH, FSH and Prolactin) and (age, body mass index, duration of infertility, Age at menarche and days of menses) .**

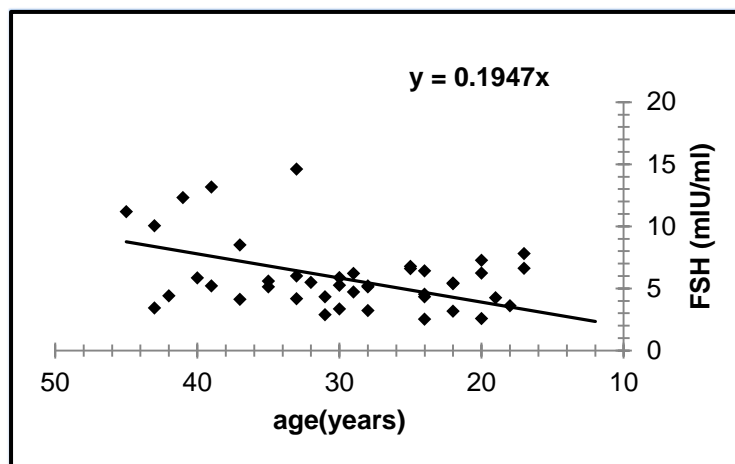
	<b>LH</b>	<b>FSH</b>	<b>Prolactin</b>
Age	r = 0.177	r = 0.349	r = - 0.270
BMI	r = - 0.09	r = 0.030	r = - 0.053
Duration of infertility	r = - 0.043	r = - 0.061	r = 0.181
Age at menarche	r = 0.121	r = 0.125	r = 0.080
Days of menses	r = - 0.143	r = - 0.144	r = - 0.212

Critical (r) value at 0.05 =  $\pm 0.297$

Critical (r) value at 0.01 =  $\pm 0.384$

Table (4) explains the correlation between the studied hormones (LH, FSH and Prolactin) and each of the following: (body mass index, duration of infertility, Age at menarche and days of menses).

It also shows that there is a significant positive correlation between the level of FSH and the age of the studies infertile women (figure 1).



**Figure 1: Regression Line and Equation between FSH level and age for the studies infertile women**

**Table 5: The mean and standard deviation of the concentration of LH, FSH and Prolactin in patients' groups classified according to : age, residence, educational level, and economic status .**

Characteristics	Groups	FSH	LH	Prolactin	P value
Age (years)	17-26	5.2 ± 1.7	3.24 ± 1.8	25.9 ± 14.3	NS
	27-36	5.3 ± 2.4	3.7 ± 1.6	25.2 ± 15.1	
	37-46	7.8 ± 3.4	3.93 ± 2.7	16.3 ± 3.4	
Residence	Rural	4.6 ± 1.4	3.9 ± 2.2	18.57 ± 7.2	NS
	Urban	6.2 ± 2.8	3.6 ± 1.9	24.1 ± 14.54	
Educational level	Illiterate	5.4 ± 1.17	4.24 ± 1.9	22.9 ± 14.9	NS
	Read and write	5.6 ± 1.22	3.6 ± 2.4	23.2 ± 13.7	
	Secondary	6.2 ± 2.8	3.9 ± 0.88	23.4 ± 10.2	
	College	8.2 ± 3.2	6.34 ± 3.1	27.1 ± 16.1	
Economic level	Higher studies	-	-	-	NS
	Adequate	4.6 ± 2.7	3.33 ± 2.8	21.9 ± 13.3	
	Adequate for some extent inadequate	7.1 ± 3.1	3.76 ± 1.4	28.9 ± 18.3	
Occupational status	inadequate	5.4 ± 2.2	5.99 ± 1.9	23.2 ± 11.7	NS
	Work	4.2 ± 1.3	3.44 ± 2.2	26.9 ± 12.3	
	Housewife	6.4 ± 2.1	3.6 ± 1.3	25.9 ± 12.3	
	Student	4.4 ± 2.6	5.88 ± 1.5	22.2 ± 12.8	

Table (5) shows that there is not any significant difference in the concentration of LH, FSH and prolactin among groups of the studied infertile women classified according to : age, residence, educational level, economic level .

**Table 6: The mean and standard deviation of the concentration of LH, FSH and Prolactin in patients' groups classified according the clinical characteristics .**

Characteristic	Groups	LH *	FSH *	Prolactin *
Duration of Infertility (days)	1-5	6.14 ± 2.9	3.8 ± 2.5	24.6 ± 14.9
	6-10	5.6 ± 2.6	3.3 ± 0.9	25.7 ± 13.6
	11-15	5.6 ± 2.4	3.5 ± 2.1	15.6 ± 4.4

Age at menarche (years)	≥ 12	5.4 ± 2.4	3.6 ± 2.5	26.5 ± 14.6
	> 12	6.2 ± 2.8	3.5 ± 1.5	20.5 ± 11.5
BMI	Normal	5.8 ± 2.6	3.3 ± 1.9	24.9 ± 15.4
	Overweight	5.68 ± 2.7	3.8 ± 2.1	23.8 ± 13.3
	Obese	7.0 ± 2.4	2.5 ± 0.5	15.6 ± 4.8
Polycystic ovarian disease	Present	6.2 ± 2.8	4.1 ± 2	24.18 ± 17.1
	Absent	5.6 ± 2.6	3.32 ± 2.02	21.3 ± 7.05
Vaginitis	Present	5.6 ± 2.8	3.3 ± 1.4	23.0 ± 12.4
	Absent	6.08 ± 2.5	3.95 ± 2.6	23.9 ± 15.04
UTI	Present	6.3 ± 3.24	3.89 ± 2.13	22.6 ± 13.25
	Absent	5.3 ± 1.9	3.27 ± 1.9	24.22 ± 13.9

**\* No significant difference was observed**

Table (6) shows that there is not any significant difference in the concentration of LH, FSH and prolactin among groups of the studied infertile women classified according to : (duration of infertility, age at menarche and days of menses, body mass index, polycystic ovarian disease, vaginitis, urinary tract infection) .

## DISCUSSION

In accordance to the socio-demographic data (table 1), the majority of the studies women were from urban regions (81.18%), while all them were housewives.

This result disagree with Mokhtar *et al.* (2006)<sup>7</sup> who achieved a similar study in Alexandria City in Egypt, they indicated (31.4%) lived in urban area, and (42.4%) worker women, such differences may be attributed to the variations of the population community and the taken sample .

The clinical history revealed a relatively high percentage (56.82%) of vaginitis, and UTI (50%) among the studies women (table 3), this is supported by other studies which reported that episodes of genital infection had a 10 fold risk of subsequent tubal infertility irrespective of the type of micro-organisms causing the infection (Mokhtar *et al.*, 2006)<sup>7</sup> .

Most of the studied women were either overweight (40.91%) or obese (22.73%), This agrees with Sudha and Reddy (2013)<sup>9</sup> , Estrogen is produced by the fat cells and primary sex organs and thus, state of high body fat or obesity causes increase in estrogen production which the body interprets as birth control, limiting the chances of getting pregnant (Wasiu Eniola *et al.*, 2012)<sup>8</sup> .

The results showed that the majority of studies women had normal hormonal levels according to the standard reference limits for FSH, LH and Prolactin, this agree Sudha and Reddy (2013)<sup>9</sup> which indicated that only (3.31%) of studied women had hormonal disturbances .

The statistical correlational results showed that there was a significant positive correlation between the level of FSH and the age of the studies infertile women (table 4), this can be supported with related similar study that indicated the significant increase levels of FSH with age, this results in



disturbances in the ovarian functions which are directly correlated with infertility (Liu *et al.*, 2015)<sup>10</sup>

According to tables (5,6) there were no significant correlation between the levels of hormones and patients subgroups classified according to socio-demographic and clinical characteristics, this may indicate that these hormones does not interfere with those characteristics.

It can be concluded that hormonal imbalance for (LH, FSH and prolactin) is just a minor suspected etiologic factor in causing infertility in the studies women, it seems that the level of FSH increases with age and the level of prolactin slightly decreases with age.

In the view of the previous conclusions, it is recommended to achieve a comprehensive case-control study for evaluating hormonal imbalance of (FSH, LH, prolactin, estrogens, progesterone, thyroid and inhibin) hormones in the infertile women in order to standardize the most predictable diagnostic hormonal tests in the routine work of infertility clinics.

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