International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

# Assessment of Serum Luteinizing Hormone, Follicle Stimulating Hormone and Esteradiol Levels among Sudanese Infertile Females

**Dr .Omer Mohamed Shoaib**

Assistant professor - Department of Clinical Chemistry, Faculty of Medical Laboratory Sciences, Alzaeim Alazhari University, Sudan

**Abstract:** ***Background and Objective: As infertility is rapidly becoming a major medical problems among Sudanese females, that has an impact on ovulation and menstruation and other complications, the aim of our present study to investigate the concentration and evaluate potential role of luteinizing hormone, follicle stimulating hormone and esteradiol in Sudanese infertile females, that may help and facilitate the diagnosis and flow up of this problem. Materials and Methods: A prospective, analytic, cross- sectional and hospital-based study included Sudanese females live in Khartoum- State- Sudan, in period from March 2012 to May 2014. A total of tow hundred infertile Sudanese females were compared with one hundred fertile females as control group, all of them were age matched , Samples were taken from test and control group in morning after overnight fasting, then serum luteinizing hormone(LH), follicle stimulating hormone(FSH) and esteradiol(E2) levels were analyzed using ELISA technique. Results: The (mean ± SD) of serum luteinizing hormone (LH), follicle stimulating hormone (FSH) and esteradiol (E2) levels in infertile Sudanese females were14.60±9.8µIU/ml, 6.51±2.048µIU/ml and 89.61±9.37 Pg/ml respectively. While that of fertile females (control group), the (mean ± SD) of serum luteinizing hormone, follicle stimulating hormone and esteradiol, were 7.00±5.26 µIU/ml, 8.13±3.88 µIU/ml,56.93±10.3 Pg/ml respectively. Serum levels of luteinizing hormone and esteradiol were significantly elevated in infertile females when compared with control group (P<0.05, serum level of follicle stimulating hormone was decreased (P>0.05).***
***Conclusion: Patients with infertility have significant increase levels of Serum of luteinizing hormone,*** *esteradiol and serum* ***follicle stimulating hormone level was reduced.***

**Keywords:** infertility, luteinizing hormone, follicle stimulating hormone, esteradiol, Sudanese

## 1. Introduction

Infertility is defined as the inability to conceive after at least 1 full year of unprotected sexual intercourse [1]. It is estimated that worldwide between 70 and 80 million couples suffer from infertility, and most of these are residents of developing countries, including the Middle East [2]. Infertility is a major problem in these countries and causes extensive social and psychological suffering[3].Complex biological processes in the mammalian ovary, such as follicular development, oocyte maturation, oocyte meiosis, ovulation and corpus luteum formation and demise, or coordinately regulated by autocrine, paracrine and endocrine factors of the hypothalamic- pituitary- ovarian axis [4]. Infertility can further be broken down into primary and secondary infertility. Primary infertility refers to the inability to give birth either because of not being able to become pregnant, or carry a child to live birth, which may include miscarriage or a stillborn child. [5, 6] Secondary infertility refers to the inability to conceive or give birth when there was a previous pregnancy or live birth. [6, 5] prevalence Female infertility varies widely by geographic location around the world. In 2010, there was an estimated 48.5 million infertile couples worldwide, and from 1990 to 2010 there was little change in levels of infertility in most of the world.[7] In 2010, the countries with the lowest rates of female infertility included the South American countries of Peru, Ecuador and Bolivia, as well as in Poland, Kenya, and Republic of Korea.[7] The highest rate regions included Eastern Europe, North Africa, the Middle East, Oceania, and Sub-Saharan Africa.[7] The prevalence of primary infertility has increased since 1990, but secondary infertility has decreased overall. Rates decreased (although not prevalence) of female infertility in high-income, Central/Eastern Europe, and Central Asia regions.[7] Specifically Follicle Stimulating Hormones (FSH) is a major promoter for orchestrating follicular development and differentiation in the granulosa cells of preovulatory follicles [8]. Luteinizing Hormone (LH) plays a key role in initiation of the ovulatory process of preovulatory follicles by activating multiple cellular signaling pathways [9]. Hormonal balance between estrogen, progesterone, FSH and LH is important to induce and promote fertility. The most common cause of female infertility is ovulatory disorder characterized by an ovulation or by infrequent and/or irregular ovulation. [10],the major causes of infertility includes ovulatory dysfunction (15%), tubal and peritoneal pathology (30-40%), and male fact (30 - 40%) and uterine pathology. To some extent the prevalence of each varies with age. Ovulatory dysfunction is mo re common in younger than old couples, tubal and peritoneal factors have a similar prevalence [11]. An elevation of prolactin (hyperprolactinemia) is thought to be a frequent cause of chronic an ovulation and infertility serum prolactin (PRL) levels were also studied as a marker of infertility [12].Deficiencies in luteinizing hormone (LH), follicle stimulating hormone (FSH) and elevated prolactin level even slight irregularities in the hormone system can affect ovulation. Estradiol production by the ovary falls near the end of a cycle but begins to increase again under the influence of FSH. Estradiol enhances the FSH effect on a maturing follicle through changes in FSH receptors of the follicular cells, but suppresses pituitary FSH and LH release during the follicular phase through negative feedback. Before mid follicular phase, estrogen concentrations are less than 50 pg/ml but rise rapidly as the follicle matures. Estradiol production increases reaching a mid-cycle peak

between 250 and 500 pg. /ml [13]. Estradiol concentration fall off abruptly after ovulation, but rise again as the corpus leteum forms, reaching concentrations of approximately 125 pg./ml during the luteal phase [13] The infertility causes due to insufficiency or imbalance hormones. The lack of ovulation may lead to mild enlargements of ovaries especially in obese patient. Fertility can be negatively affected by obesity.

## 2. Materials and Methods

### 2.1 Reagents

All chemical reagents were purchased from Bio system company (Spine Company for Analytical material and chemical Reagents).

### 2.2 Subjects and Study Population

The present study was descriptive, analytic, and hospital-based study, carried out in Khartoum State educational hospitals, Sudan. Two hundred infetirile females and hundred healthy females, all of whom were age matched. Blood samples were obtained after an overnight fast for measurement of LH, FSH and E2 levels.

### 2.3 Samples Collection and Preparation

The blood samples were drawn in the morning after overnight fasting in the morning (between 0800 and 1100 h).Five ml blood from each individual of study population, were collected from both test and control group, using standard venipuncture techniques. Sample was allowed to clot for 30 minutes and then centrifuged at3000 rpm for 10 minutes to obtain clear, transparent serum. The separated serum was analysed for serum LH, FSH and E2 estimation or stored at 2-80c for maximum period of 5 days if not tested immediately. Hormones determined using ELSIA technique.

### 2.4 Statistical Analysis

Data was analyzed by computer program (SPSS) version IBM 20. Student T. test was used for the Calculation of P value. P≤0.05 was considered significant.

## 3. Results

In this study all participants were 20-45 years of age. Table 1 showed the baseline characteristics of infertile females and the control group .LH, E2 levels were significantly high ($P < 0{\cdot}05$) and serum FSH level in infertile females was reduced ($P > 0{\cdot}05$) as shown in Table 2. Significant correlation could be found between serum LH, FSH and BMI in the study group as shown in figure [1& 2] respectively, there was very weak negative correlation between serum esteradiol and BMI as shown in figure[3], in our present study there was a significant correlation between serum FSH and LH as shown in figure[4]

**Serum luteinizing hormone:**
Table (2) shows a highly significant difference between the means of serum LH of the test group (n=200) and the control group (n=100). Mean ± SD :( 14.60±9.8) versus (7.00±5.26) mIU/ml, P=0.001. Figure [1] shows no significant correlation between the body mass index (BMI) and the serum levels of LH (r= -0.15, p = 0.03). In this study 89 subjects with infertility (44.5%) had abnormal high serum levels of LH.

**Serum follicle stimulating hormone:**
Table (2) shows no significant difference between the means of serum FSH of the test group and the control group Mean±SD :( 6.51±2.04) versus (8.13±3.88) mIU/ml, P=0.005. Moreover, Figure [2] shows no correlation between the body mass index (BMI) and the serum levels of FSH (r=0.00). However, in this study 7(3.5%) subjects with infertility had abnormal high serum levels of Follicle stimulating hormone. Additionally, the current study indicated that there was a significant and strong correlation between the LH and the serum levels of FSH in female with infertility as shown in figure [4] .

**Serum Estradiol:**
Table (2) shows a significant difference between the means of serum estradiol of the test group and the control group Mean ± SD: (89.61±9.37) versus (56.93±10.3) Pg/ml, P=0.011.While, Figure [3] shows no significant correlation between the body mass index (BMI) and the serum levels of E2 (r= -0.11, p = -0.13). Eventually, in this study 31(15.5%) subjects with infertility had abnormal high serum levels of estradiol.

**Table 1:** Baseline characteristics of infertile females and control

| Variable | Test group | Control group |
|---|---|---|
| Age/years | 29.61±5.41* | 31.23±4.93* |
| Weight/Kg | 72.83±10.88* | 68.03±11.31* |
| Height/Cm | 160.00±6.00 | 162.60±5.52 |
| BMI/Kg/m² | 29.76±4.24* | 24.14±3.76* |

** The means is a significant difference between different values, (P<0.05).*

**Table 2:** Mean ± SD of Serum LH, FSH and E2 in the test group and control group

| Parameters | Test group | Control group |
|---|---|---|
| LH mIU/ml | 14.60±9.8* | 7.00±5.26* |
| FSH mIU/ml | 6.51±2.04 | 8.13±3.88 |
| Estradiol Pg/ml | 89.61±9.37* | 56.93±10.3* |

** The means is a significant difference between different values, (P<0.05).*

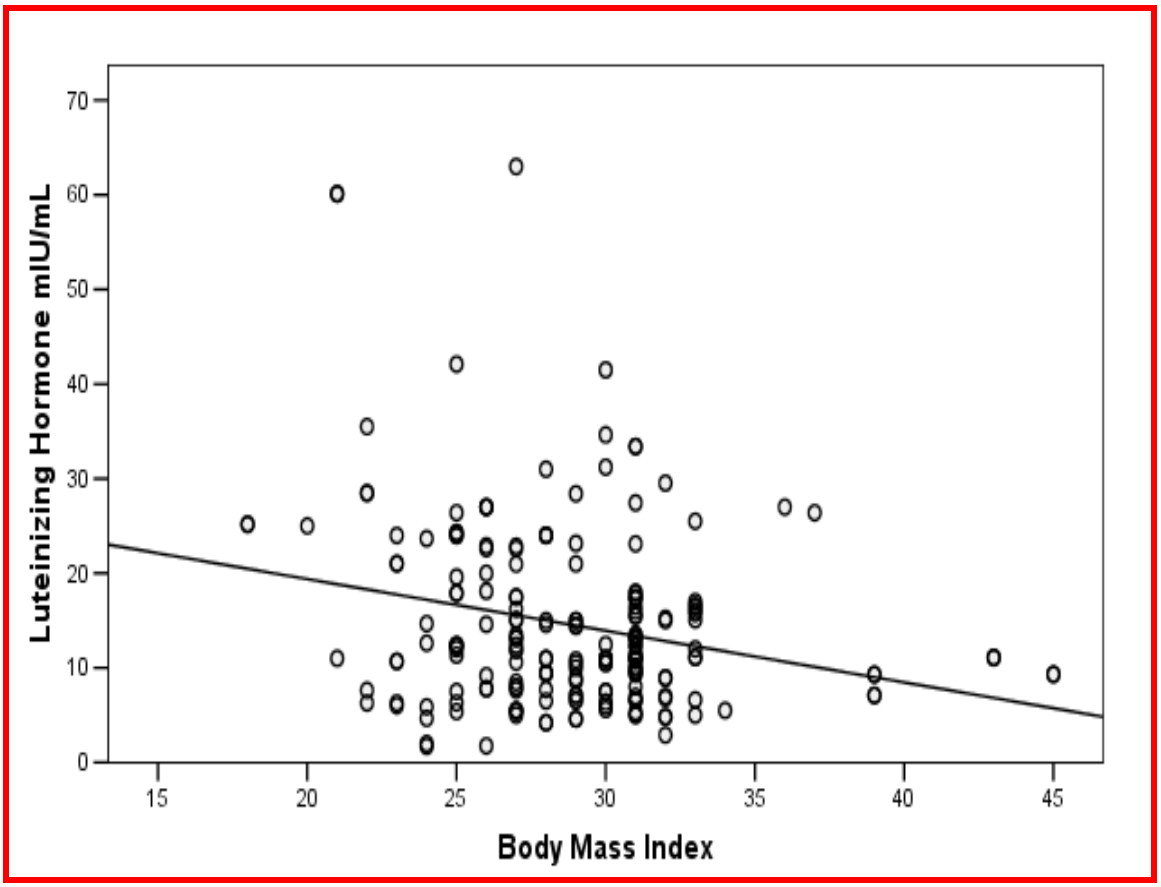


**Figure 1:** Ascatter plot shows correlation between Body Mass Index (IBM) and LH in the study group (r = 0.06, p= 0.38)

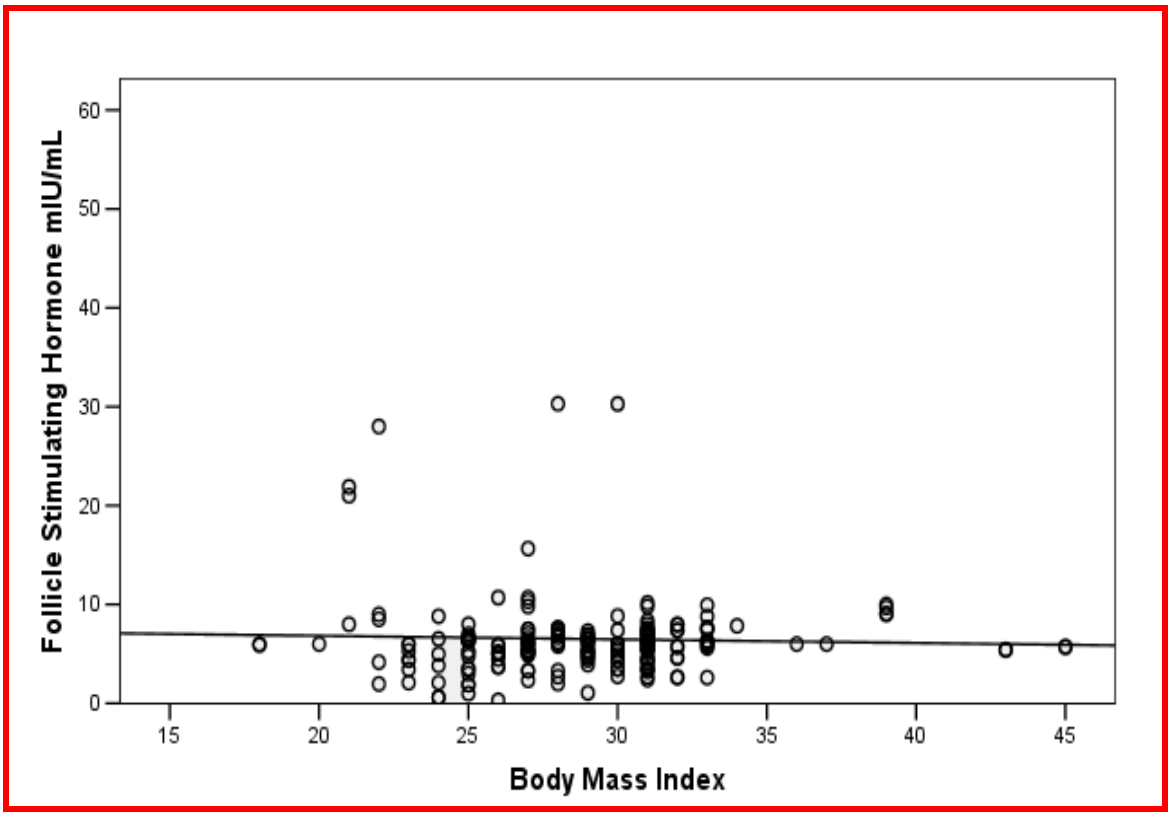


**Figure 2:** Ascatter plot shows correlation between Body Mass Index (IBM) and FSH in the study group (r = 0.06, p= 0.38)

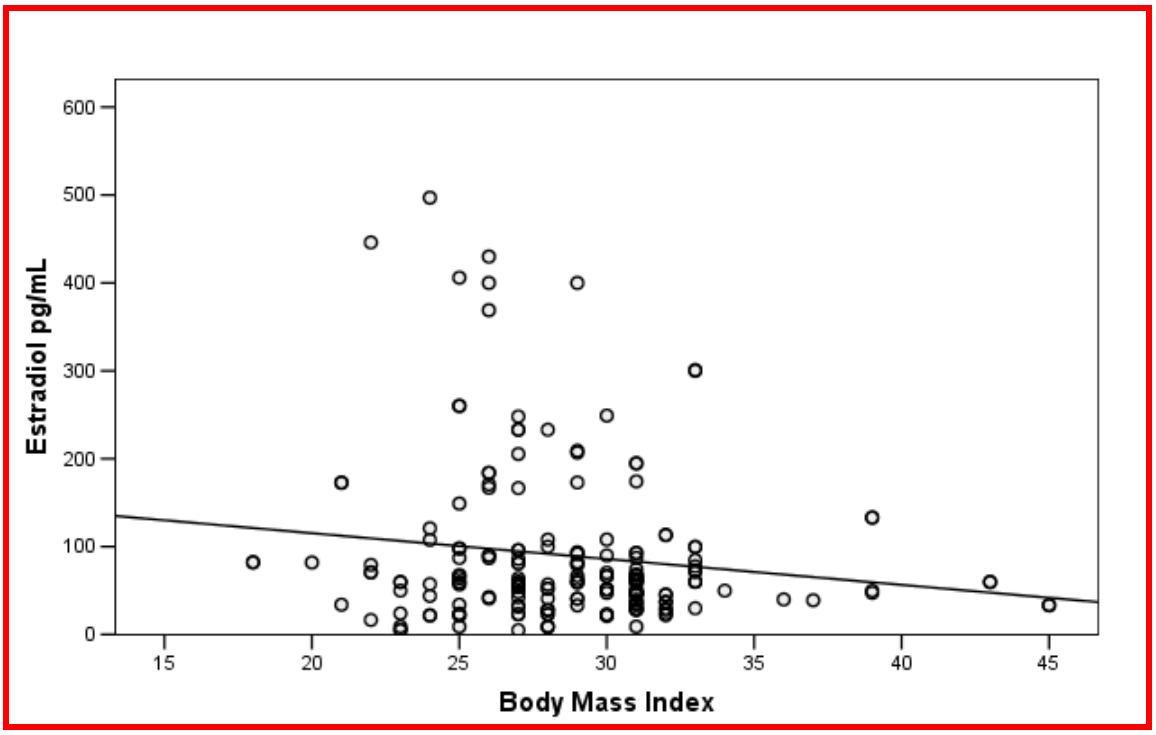


**Figure 3:** Ascatter plot shows correlation between Body Mass Index (IBM) and Estradiol in the study group (r = -0.11, p= 0.13)

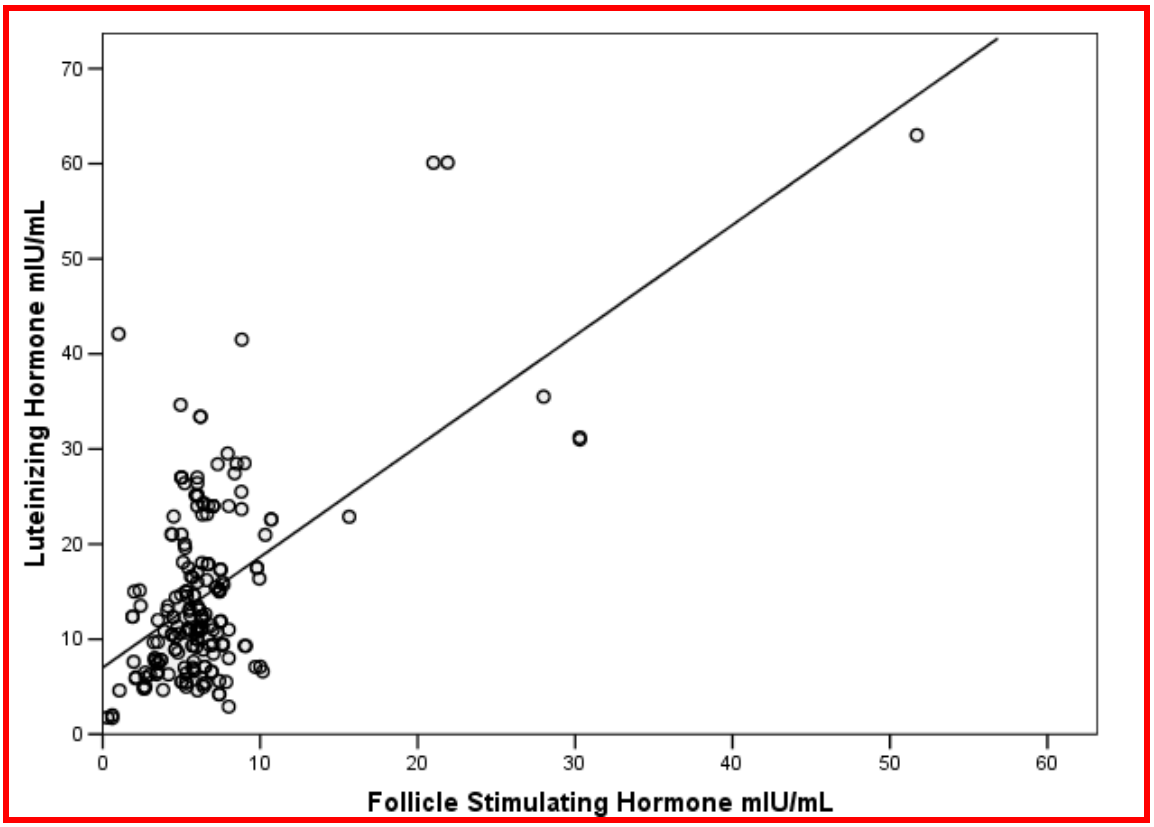


**Figure 4:** Ascatter plot shows correlation between Luteinizing Hormone and Follicle Stimulating Horomone in the study group (r = 0.60, p= 0.00)

## 4. Discussion

Infertility is generally defined as one year of unprotected intercourse without conception. Approximately 85-90% of healthy young couples conceive within one year. Infertility affects 10 -15 % of couples, is an important part of investigation and helps the couple to have children (Mosher, et al., 1991). Many people may be infertile during their reproductive years. They may be unaware of this infertility. Many parameters are outlined for the cause of infertility like age, lifestyle and physical problems etc.

The amounts of FSH and LH released and their specific functions change as the cycle progresses. FSH stimulates the

growth of follicles in the ovaries. Each follicle contains an egg and produces additional hormones. LH helps FSH to stimulate the production of these hormones, both before and after ovulation. Roughly half way through the menstrual cycle, a sudden surge of LH and FSH causes a small rupture of the dominant follicle, releasing the egg. At this stage of the cycle, LH is the most important hormone because it enables the egg to become mature and ready for fertilization [14]. This study indicate a significantly decrease in FSH levels in the test group, and this result was in agreement with Jose-Miller et al study which found a decrease level of FSH in infertile women that causes ovulation failure, subsequently failure in the role of genital glands and menstrual cycle which lead to infertility [15]. Several researches confirm the role of high concentration of LH after ovulation stimulates the granulosa cell of the ruptured follicle to luteinize and to form the corpus luteum which synthesizes and secrets progesterone and estradiol. Progesterone is the principle hormone of the luteal phase and prepares the endometrium for the implantation of fertilize ovum. Whereas the decreased levels of LH was accompanied with rises of prolactin levels in blood, Kallman syndrome and decrease gondotropin [16, 17].Veena Bhaskar et al found that serum PRL levels is a marker of infertility and determine its relation to oxidative stress and antioxidants [12]. High circulating levels of PRL may inhibit ovarian function and ovulation by both central and peripheral mechanisms [18].

In this study, women with infertility had a significantly increase serum levels of Luteinizing hormone when compare with control subjects , this agrees with a study done by Wild et al[19] who reported that patients with infertility who suffering from polycystic ovary syndrome (PCOS) had higher serum (LH) to (FSH) ratios, also consistent with a study done by Fauser et al., who reported that, both the absolute level of circulating LH and its relationship to FSH levels are significantly elevated in PCOS women as compared with controls, this is due to increased amplitude and frequency of LH pulses. Elevated LH concentrations (above the 95th percentile of normal) can be observed in 60% of PCOS women [20], whereas the LH/FSH ratio may be elevated in up to 95% of subjects [21], if women who have ovulated recently are excluded. LH levels may be influenced by the temporal relationship to ovulation.

The current study indicated that there was a significant, strong positive correlation between the Luteinizing hormone and the serum levels of Follicle stimulating hormone in women with infertility in agreement with that reported by Taylor et al [22], 1997 who found that the LH/FSH ratio may be elevated in up to 95% of subjects, if women who have ovulated recently are excluded. LH levels may be influenced by the temporal relationship to ovulation.

This study shows, there was no significant correlation between the body Maas index (BMI) and the serum levels of LH, this result goes with a study done by Yen et al[21], who reported that serum LH concentrations are commonly elevated in an infertile women with PCOS. Finally, this study showed a significant reduction in the serum levels of follicle stimulating hormone in the test group, compared with the control subjects, and this is in agreement with a study done by Wild et al [19]who found that infertile patients with polycystic ovary syndrome had higher serum (LH) to (FSH) ratios. Also this study reported that there was no correlation between the body mass index (BMI) and the serum levels of Follicle stimulating hormone

## 5. Conclusion

The author of this study concluded that hormones play a crucial role in infertility in females, as was reflected by the clear increased levels of E2 and LH and decreased level of FSH in women with infertility and increased level of LH / FSH ratio. Health care should be provided to all patients suffering from infertility, further studies needed for others hormones.

### References

[1] Ismail A.A., Sakr S.H. "Low-Cost Infertility Management ",Current Women's Health Reviews, Vol.6, pp73-83, 2010.
[2] Boivin J., Bunting L., Collins J.A., Nygren K.G. "International estimates of infertility prevalence and treatment- seeking: Potential need and demand for infertility medical care", Human Reprod, Vol.22, pp1506-12, 2007.
[3] Pennings G., de Wert G., Shenfield F., Cohen J., Tarlatzis B., Devroey P. "ESHRE Task Force on Ethics and Law 15: cross-border reproductive care, Vol.24, No.5, pp 1008-1011, 2009.
[4] Satoh M., Tokoro M., Ikegami H., Nagai K., Sono Y., Shin S.W., Nishikawa S., Saeki K., Hosoi Y., Iritani A., Fukuda A., Morimoto Y., Matsumoto K. "Proteomic Analysis of the Mouse Ovary in Response to Two Gonadotropins, Follicle-Stimulating Hormone and Luteinizing Hormone". Journal of Reproduction and Development, Vol. 55, No. 3, pp 316-326, 2009.
[5] World Health Organization 2013."Sexual and reproductive health: Infertility definitions and terminology".Availablehttp://www.who.int/reproductive health/topics/infertility/definitions/en/.RetrievedNovem ber 5, 2013.
[6] Rutstein, Shea O., and Iqbal H. Shah. "Infecundity, Infertility, and Childlessness in Developing Countries." DHS Comparative Reports No. 9 (2004): 1-57.
[7] Mascarenhas, M.N., Flaxman, S.R., Boerma, T., Vanderpoel, S., Stevens, G.A. (2012). "National, Regional, and Global Trends in Infertility Prevalence Since 1990: A Systematic Analysis of 277 Health Surveys "PLOS Med (9;12) e1001356. doi:10.1371/journal.pmed.1001356
[8] Wayne C.M., Fan H.Y., Cheng X., Richards J.S. "FSH-induces multiple signaling cascades: evidence that activation of SRC, RAS and the EGF receptor are critical for granulosa cell differentiation", Mol. Endocrino.l , Vol.21, pp 1940–1957, 2007.
[9] Russell D.L., Robker R.L, "Molecular mechanisms of ovulation: co-ordination through the cumulus complex" , Hum Reprod Update ,Vol.13, pp 289–312, 2007.
[10] Elghblawl E." Polycystic ovary syndrome and female reproduction", Br.J.Nurs.,Vol.16, No.18, pp1118 -1121, 2007.

[11] Mohan K, Sultana M . "Follicle Stimulating Hormone, Luteinizing Hormone and Prolactin Levels in Infertile Women in North Chennai, Tamilnadu", J . Biosci . Res.,Vol. 1, No.4 , pp 279 -284, 2010.
[12] Veena Bhaskar S., Upadhya S., Adiga S.K., Pratap Kumar N. "Evaluation of oxidative stress, antioxidants and prolactin in infertile women", Indian Journal of Clinical Biochemistry,Vol. 23, No.2, pp 186-190, 2008.
[13] Stancyk. Infertility. Boston black well scientific publications .1991; 53-76.
[14] Guyton A., Hall J.E. Text book of medical physiology , Used, Elsevier Saunders, Philadelphia: pp1017- 1018, 2006.
[15] Jose - Miller A.B., Boyden J.W., Frey K.A. "Infertility Am Fam Physician., Vol. 75, No.6, pp 849-856, 2007.
[16] Sadler T.W. Longmans medical embryology, 9th ed , Lippincott Williams&Wilkins, Philadelphia, pp 3- 49, 2004.
[17] Goldman M.D., Bennett C. Ovaries and development, menstrual cycle and infertility (women5s health). In: Cecia text book of medicine 21th ed. W.B.Sanders, Philadelphia: 1490- 1509, 2004.
[18] Matsuzaki T., Azuma K., Irahara M., Yasui T., Aono T. "Mechanism of anovulation in hyperprolactinemic amenorrhea determined by pulsatile gonadotrophinreleasing hormone injection combined with human chorionic gonadotrophin", Fertil Steril,, Vol.62, pp 1143-9, 1994.
[19] Wild R, Painter P,Coulson P, Carruth K, Ranney G.Lipoprotein lipid concentrations and cardiovascular risk in women with polycystic ovary syndrome.JClin Endocrine Metab. 1985; 61:946-951.
[20] Laven JS, Imani B, Eijkemans MJ and Fauser BC. New approaches to PCOS and other forms of anovulation. Obstet Gynecol Surv2002; 57,755–767.
[21] Yen SSC, Vela P, Rankin J.Inappropriate secretion of follicle-stimulating hormone and luteinizing hormone in polycystic ovarian disease. J Clin Endocrinol Metab 1970;30:435–442.
[22] Taylor AE, McCourt B, Martin KA. Determinants of abnormal gonadotropin secretion in clinically defined women with polycystic ovary syndrome. J Clin Endocrinol Metab1997; 82:2248–2256.