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Research Article

## EFFECT OF CLOMIPHENE CITRATE ON FERTILITY HORMONES IN FEMALE PATIENTS WITH POLYCYSTIC OVARIAN SYNDROME FROM LAHORE

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**Abstract:**

*This study was undertaken to see the effects of Clomiphene Citrate on fertility hormones in patients having anovulatory infertility associated with polycystic ovary syndrome. Fifty infertile patients with PCOS who were started with clomiphene citrate (50–150mg/day for 5 days). For Ovarian response ovulation was monitored by transvaginal ultrasonography and serum levels of FSH, LH, progesterone, estrogen was also estimated by using ELISA methods.*

**Keywords:** PCOS, Clomiphene citrate, anovulation

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## INTRODUCTION:

Infertility is a one of most common disease and problem which can upset the normal living and social pattern of the people life. Therefore, it is a very common problem which effecting human race and reached up to 50 to 80 million in the world total [1]. Female reproductive pattern is control with a balance hormonal system. These hormonal regulation works with positive and negative feedback mechanisms [1]. PCOS (Polycystic ovarian syndrome) is the most occurring cause of infertility in women at the age of puberty or at a child bearing stage. [15] Anovulation or absence of egg production is common cause of infertility in PCOS. Therefore in PCOS patients are treated with clomiphene citrate and it is used very commonly for induction of ovulation in PCOS. This drug is a selective estrogen receptor modulator (SERM). [2,3]

In start it is given in a dose of 50mg/day. This amount can be then increased up to 250mg/day. This drug is given with combination of other drugs for better results and effects. As in insulin resistance in PCOS this drug is given with insulin lowering drugs. Clomiphene Citrate is also given with some other drugs as exogenous gonadotropins to induce ovulation. [4]

Clomiphene Citrate has better effect and anti infertility properties when used in female for ovulation and its clomiphene drug has better results for induction of pregnancy given in combination. It induces induction of ovulation in females with amenorrheic symptoms and ovulatory women. [5] Clomiphene Citrate has a direct effect on release of GnRH and its effects its release. Therefore it effects the production of FSH and LH. As GnRH secretion effects the stimulation and release of FSH and LH. Clomiphene Citrate effects directly on the hypothalamic-pituitary-ovarian axis. There is a rise in levels of FSH and LH with clomiphene citrate. [6] Clomiphene Citrate also increases the levels of estrogen hormone along with LH and this cause induction of ovulation. [7] Clomiphene citrate has

75% to 80% ovulation rates and also 30% to 40 % conception rates. Therefore, Clomiphene Citrate is used preferably as a drug of choice especially in females with PCOS. [8]

There are multiple criteria for evaluation of PCOS but Human Reproduction Embryology (ESHRE), the American Society for Reproductive Medicine (ASRM) criteria has proposed points for PCOS diagnosis and detection. According to criteria diagnosis of PCOS made on anovulation, elevated androgens in serum, and present of cyst in ovaries which lead to morphological changes in them. Normal ovulation is disturbed in PCOS due to imbalance in hormones. These hormones included progesterone, estrogen, FSH and LH. [9]

In Pakistan the prevalence of the polycystic ovarian syndrome (PCOS) is about 52%, and it is much higher than the number of patients with PCOS in UK which is about 20 to 25%. [10]

Pakistan is also a populous country in the world. About 2% is its growth rate with infertility rate of 21.9% so one fifth of married people are facing this problem in Pakistan. [11]

Studies show that occurrence of PCOS is more in young females then in older women and percentage of primary infertility is more than secondary infertility. [12] The level of LH and other hormone like FSH, and prolactin are also increased in women with simple infertility with no PCOS. [13] Sometimes patients with clomiphene therapy not respond to the treatment as they are resistant to Clomiphene Citrate, about 25% people are resistant to Clomiphene Citrate. [14]

In such patients a combine therapy along with Clomiphene Citrate is used. [15] Therefore hormones are important to regulate reproduction and reproduction is effected by outer environment and also with hormones. [16]

This research will help clinician to demonstrate the benefits of clomiphene and its uses to treat infertility in patient with PCOS and other anovulation conditions.

## Subjects and methods:

The Evaluation of hormonal profile FSH (follicular stimulating hormone), LH (luteinizing hormone), Estrogen and Progesterone was performed at clinical laboratory of Services Hospital, Lahore. The Levels of these hormones were observed in 60 women with

## MATERIALS AND METHODS:

### Objectives of this study

As reproduction is a basic desire for human instinct. Infertility is one of major problem faced by huge population. The main concern and aim of this study was to evaluate the effect and pattern of important reproductive hormones like FSH, LH, Estrogen and Progesterone in infertile women with PCOS. The study was conducted in infertile women who were attending infertility clinic at Service Hospital, Lahore.

infertility and 50 healthy fertile women as a control group. The levels hormones were measured by the micro well enzyme linked immunosorbent assay (ELISA) technique based on the noncompetitive sandwich principle for LH, FSH, Estrogen and Progesterone. ELISA kits were used for the measurement of these hormone levels.

#### Population study:

Services Hospital Lahore is one of the major teaching hospitals in Pakistan. We selected 60 infertile patients with PCOS and 50 healthy subjects as control.

#### Exclusion criteria:

Patient having hyperprolactinemia, ovarian hyper stimulation syndrome, diabetic patients, or any thyroid problem.

#### Inclusion criteria:

Patient diagnosed infertile PCOS with tenure of more than one year after marriage.

BMI, a weighting scale is used to measure weight (Lee & Nieman 2003)

A thorough history of patients was noted on a Questionnaire, the height and weight of the selected patients was noted and finally their blood samples were collected.

#### RESULTS:

100 patients were included in this study, out of these 50 were infertile with PCOS, and 50 were taken as control group. The details are given in Table.

In the table 1 for LH, the mean level of LH hormone in PCO patients before treatment were  $5.74 \pm 0.939$  while after treatment with CC the mean level of LH was noted  $3.716 \pm 0.513$  which is satisfactory significant.

In the table 2 for FSH, the mean level of FSH hormone in PCO patients before treatment were  $3.804 \pm 1.163$  while after treatment with CC the

mean level of FSH was noted  $5.644 \pm 1.1306$  which is satisfactory significant.

In the table 3 for Progesterone, the mean level of Progesterone hormone in PCO patients before treatment were  $2.098 \pm 1.233$  while after treatment with CC the mean level of Progesterone was noted  $10.704 \pm 2.313$  which is satisfactory significant.

In the table 4 for Estradiol, the mean level of Estradiol hormone in PCO patients before treatment were  $51.458 \pm 7.091$  while after treatment with CC the mean level of Estradiol was noted  $37.72 \pm 4.969$  which is satisfactory significant.

The P-value for testing means before and after groups for Estradiol we applied Paired T-test and P- value is found to be  $<0.001$  which is less than 0.05, so the difference in mean are significant different which show that there exit the difference in before and after groups which is due to treatment applied.

This table 1 shows the hormonal level in PCOS women before and after the use of Clomiphene citrate drug. There are abnormal LH, FSH, Progesterone, Estradiol levels in women with PCOS. There is abnormal high level of luteinizing hormone in PCOS and decrease in follicular stimulating hormone in PCOS. In PCOS there is also decrease in progesterone and increase of estradiol serum level. But after the use of drug Clomiphene citrate there is significant change in the values of PCOS hormonal level.

The value of these hormonal level obtained is less than 0.001 ( $<0.001$ ) which shows significant change of before and after use of Clomiphene citrate in PCOS. Therefore there is significant change in PCOS patients and their hormonal profile after dose of Clomiphene Citrate drug. There is significant change in the plasma hormonal level after use of Clomiphene citrate.

Table 1: Comparison of LH, FSH, Progesterone and Estradiol in patients before and after treatment with Clomiphene citrate

Hormones	Infertile women with PCOS Before CC (mean $\pm$ SD)	Infertile women with PCOS After CC (mean $\pm$ SD)	P Value (P<0.05)
LH mIU/ml	5.74 $\pm$ 0.939	3.716 $\pm$ 0.513	<0.001
FSH m IU /ml	3.804 $\pm$ 1.163	5.644 $\pm$ 1.1306	<0.001
Peogesterone ng/ml	2.098 $\pm$ 1.233	10.704 $\pm$ 2.313	<0.001
Estradiol Pg/ml	51.458 $\pm$ 7.091	37.72 $\pm$ 4.969	<0.001

.Fig 1 : The comparison of serum LH levels before and after treatment with Clomiphene Citrate

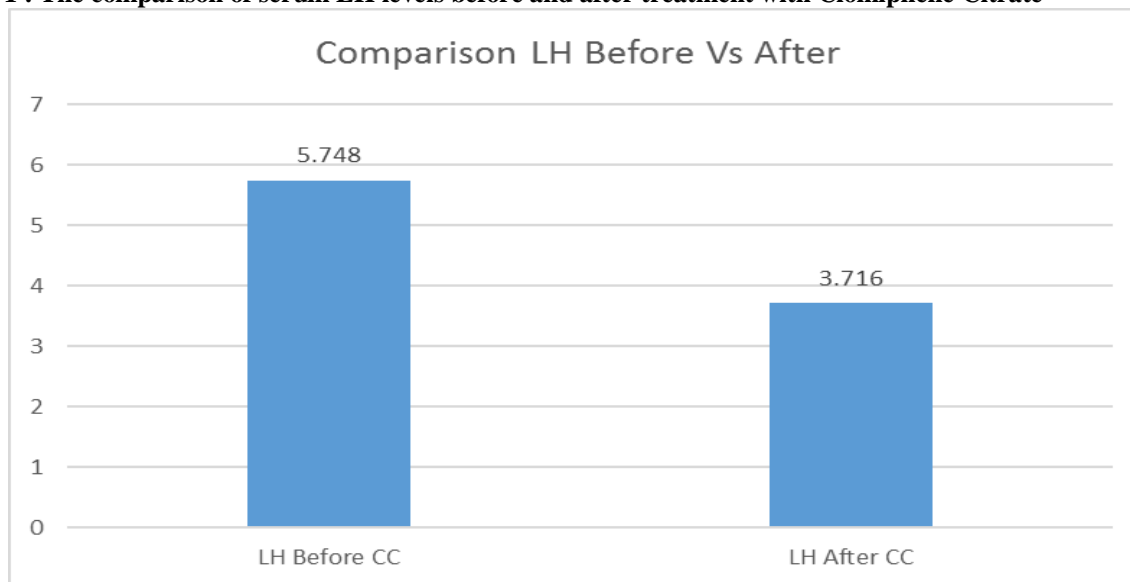
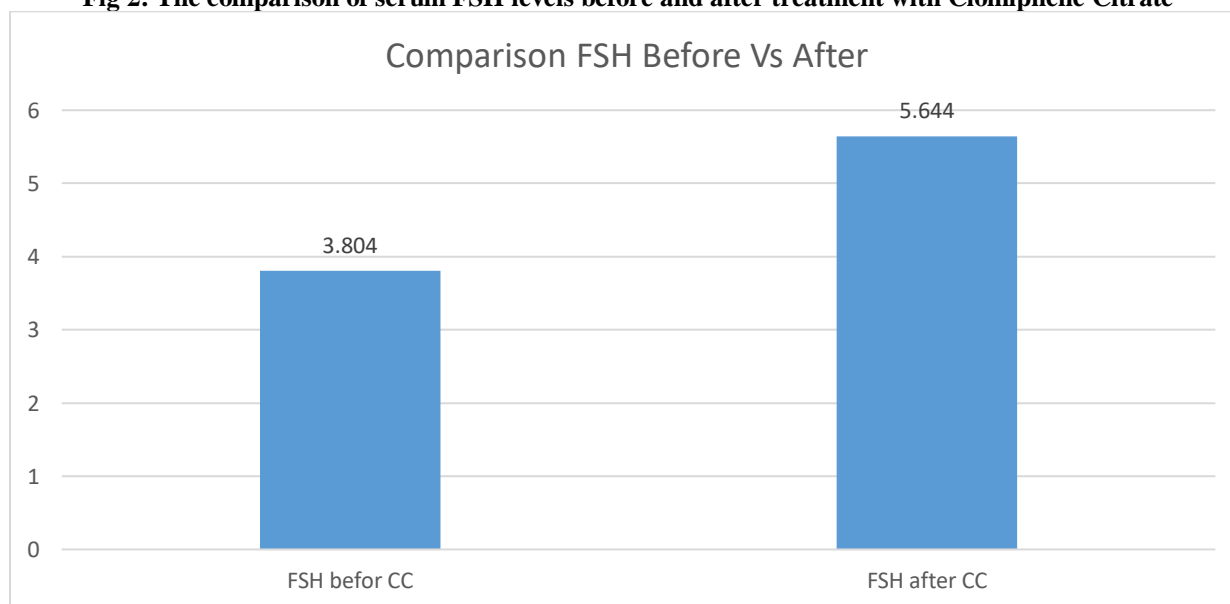
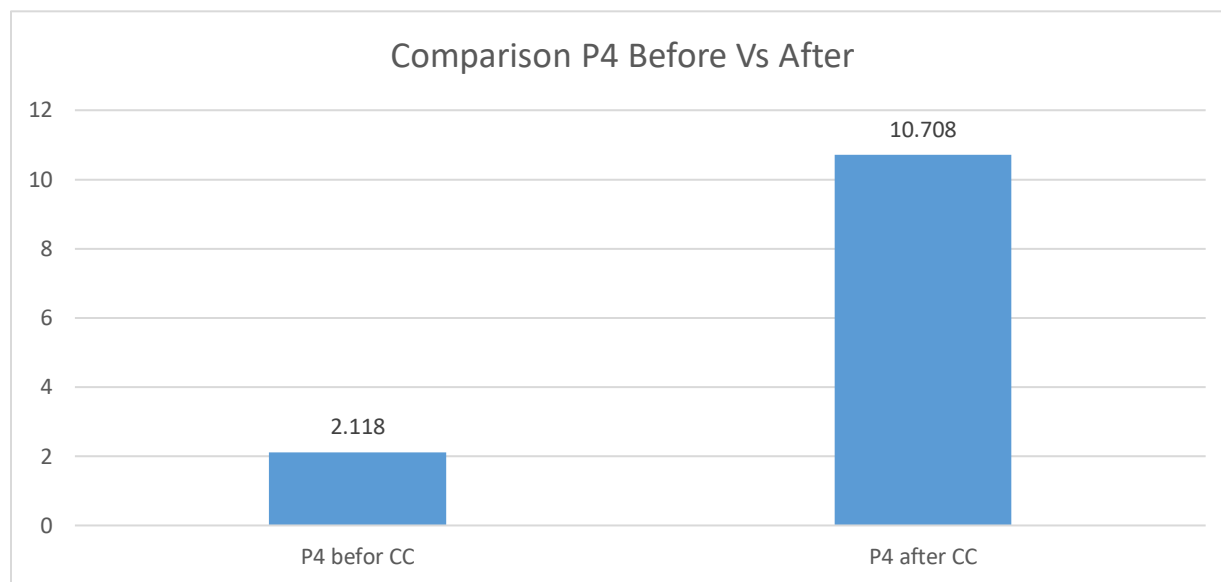
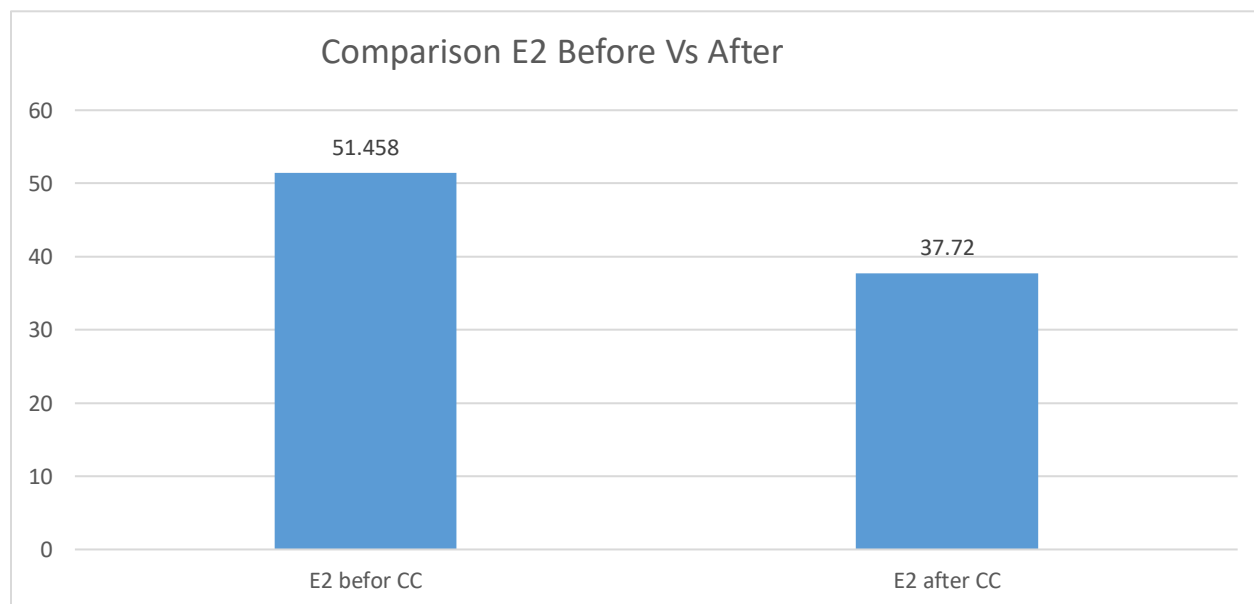


Fig 2: The comparison of serum FSH levels before and after treatment with Clomiphene Citrate



**Fig 3: The comparison of serum Progesterone levels before and after treatment with Clomiphene Citrate****Fig 4: The comparison of serum Estradiol levels before and after treatment with Clomiphene Citrate****Table 2: Comparison of levels of LH, FSH, Progesterone, Estradiol and BMI between control and PCOS Groups**

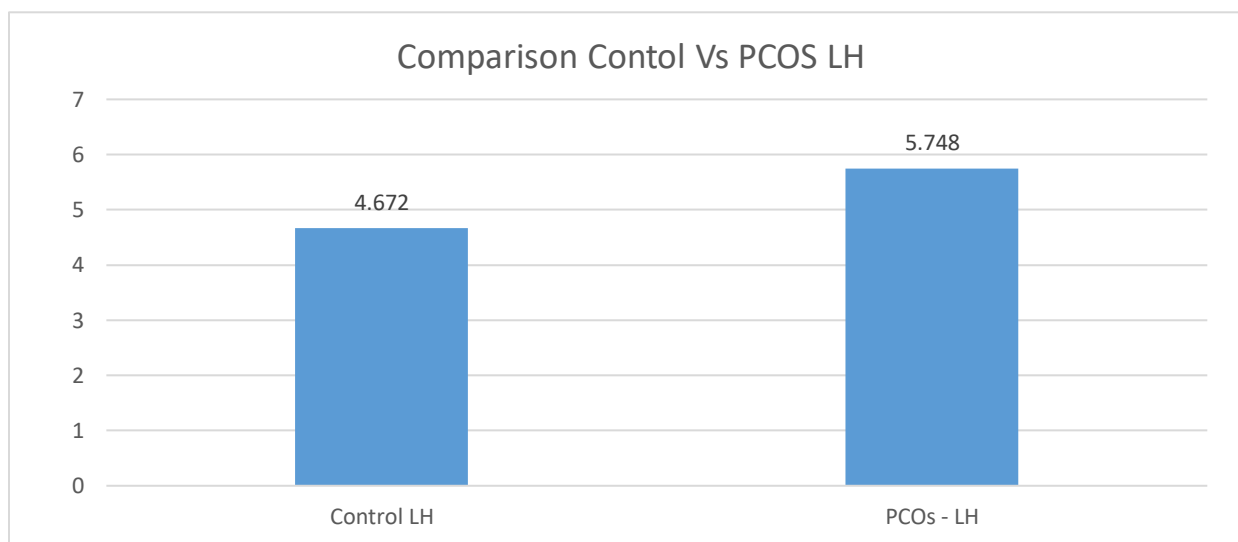
Hormones	Control (mean±SD)	PCOS (mean±SD)	P value (P<0.05)
LH I U/ml	4.672± 1.0065	5.748 ± 0.9390	<0.001
FSH I U/ml	6.4 ± 0.9617	3.804± 1.16320	<0.001
Progesterone mg/ml	11.13 ± 2.352	2.098 ± 1.2332	<0.001
Estradiol Pg/ml	30.06 ± 4.41	51.458± 7.0911	<0.001
BMI	21.772 ± 2.9604	23.842 ±0.6658	<0.001

The table 2 shows the level of plasma serum level of reproductive hormones. The level of luteinizing hormone is increased in PCOS women. While it is normal in Control women. The value of follicular stimulating hormone and progesterone hormone is also decreased in the PCOS women. While hormonal level is normal in Control women. The value of Estradiol hormone is high in PCOS. While its value is normal in Control women.

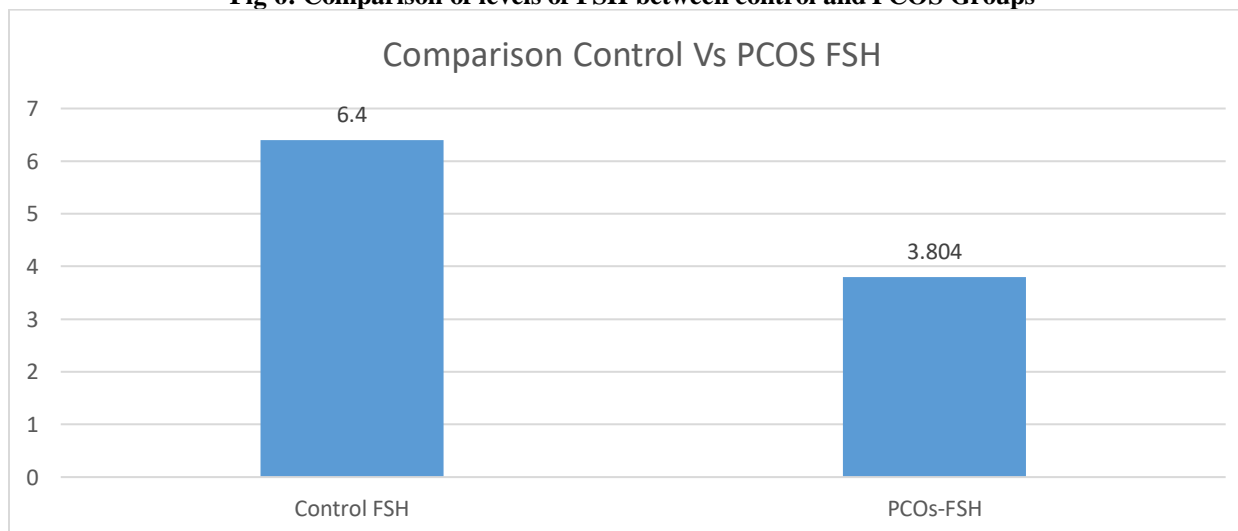
This elevated or decreased level of hormone in PCOS is due to disturbed hormonal pattern as PCOS presented with abnormal hormonal level. These abnormalities lead to infertility in PCOS. There is also a significant difference in BMI in PCOS and control group.

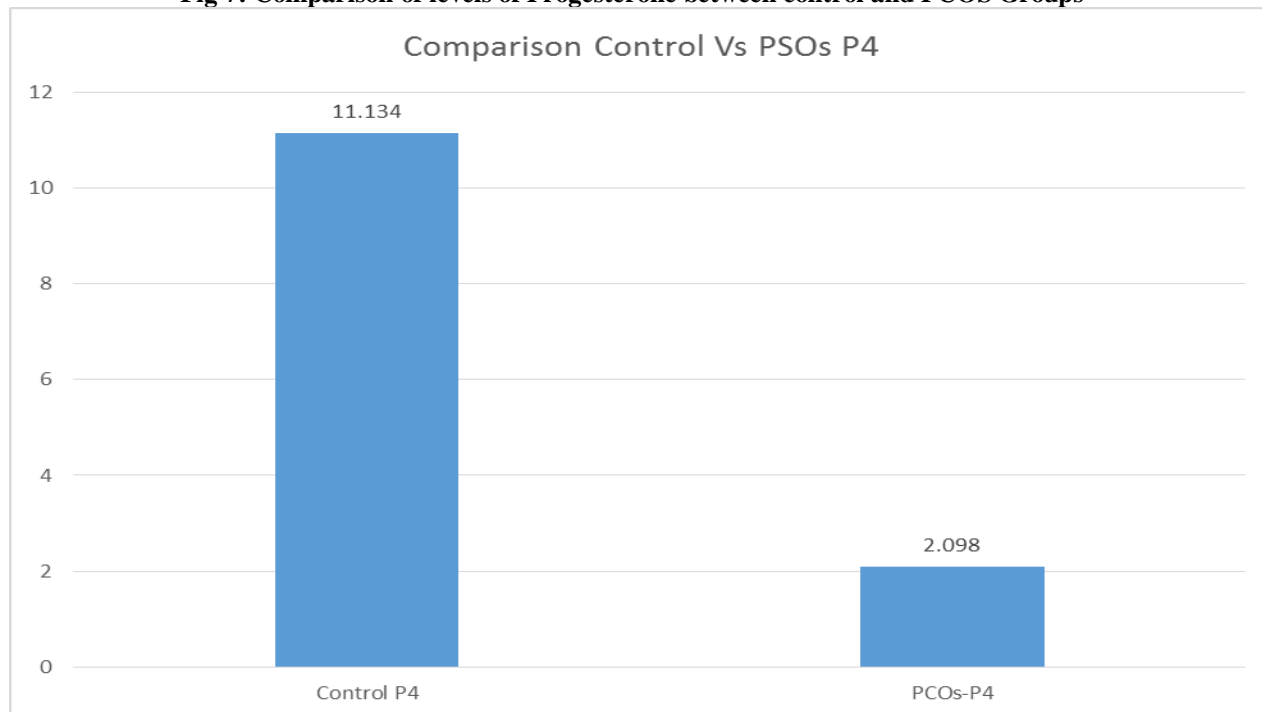
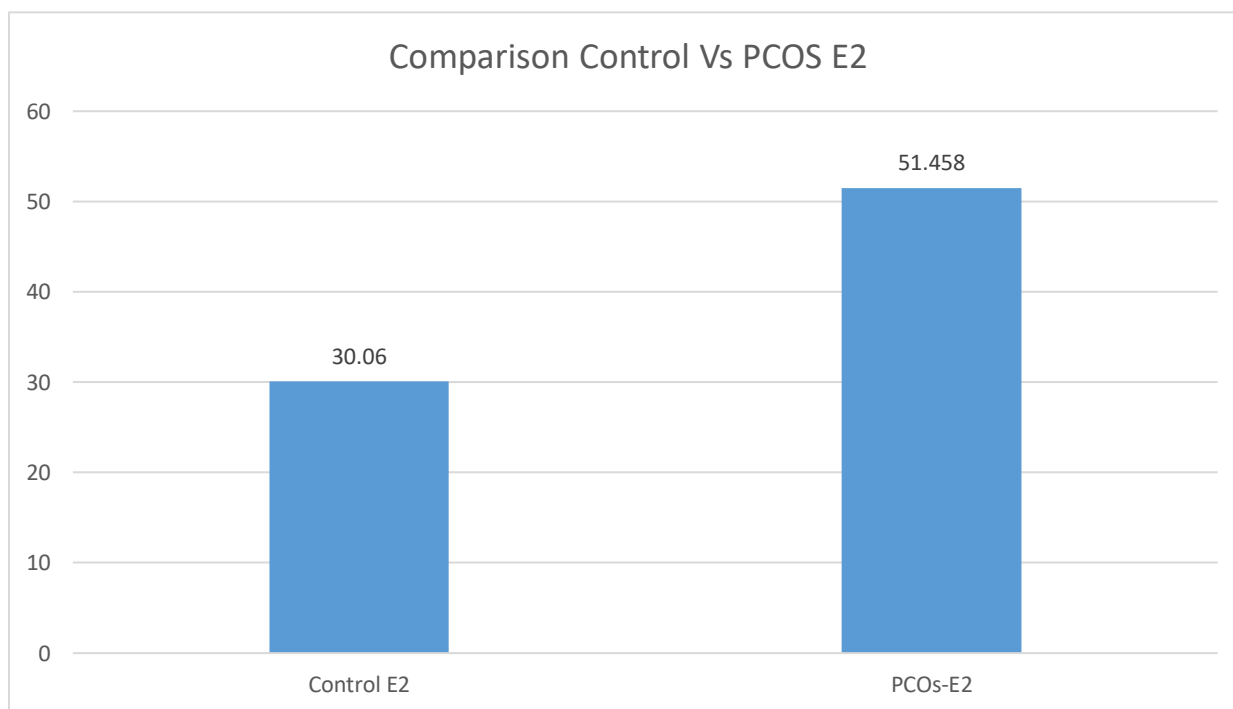
As increase in weight in PCOS women is also common which also has additional complication which leads to infertility? While hormones in Control groups are within normal range.

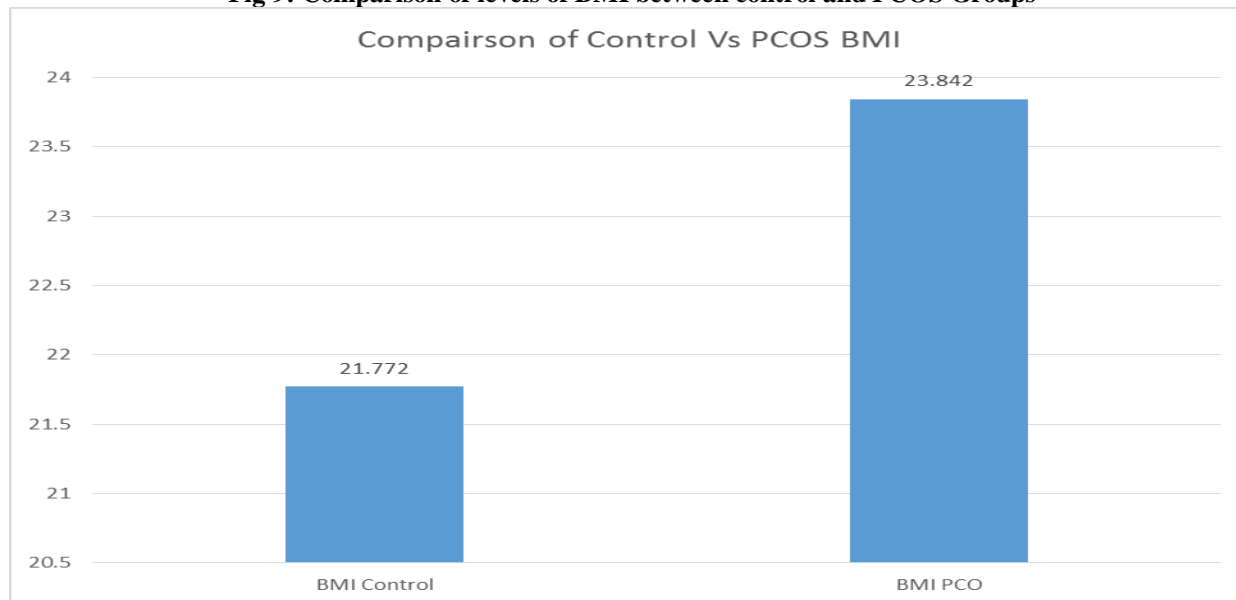
**Fig 5: Comparison of levels of LH between control and PCOS Groups**



**Fig 6: Comparison of levels of FSH between control and PCOS Groups**



**Fig 7: Comparison of levels of Progesterone between control and PCOS Groups****Fig 8: Comparison of levels of Estradiol between control and PCOS Groups**

**Fig 9: Comparison of levels of BMI between control and PCOS Groups****DISCUSSION:**

Clomiphene Citrate is an anti-estrogenic drug which also decreases the estrogen effect and also decreases the LH serum and it also decrease the premature LH surge. [17] In a cohort study by Branigan et al., the effects of Clomiphene Citrate and Oral Contraceptive Pills (OCP) in preventing hypersecretion of LH in women who were gone under IUI was assessed. Al-Inany et al. assayed the effect of Clomiphene Citrate in reducing LH secretion. Having best anti estrogenic effect, it also increases FSH level and also effects on the 21 day serum progesterone increase it. [18] Hyper secretion of LH is related to increase miscarriages and decrease pregnancies rate. [19]

It has been observed that present study on 50 women's with PCOS shows significant changes as compare to normal studied women. As polycystic ovarian syndrome is a heterogeneous clinical disease associated with infertility in young women. Increased LH decrease in FSH is hallmark of this disease. Therefore elevated LH and low FSH and progesterone effect the normal induction of ovulation. Due to this decrease level of FSH follicles does not grow in women with PCOS. High levels of LH increase the production of androgen hormones. BMI difference between both PCOS women and control studied women is also significant as weight of PCOS women is slightly high then normal. As these findings are same to other published reports (Rogers and mitchel 1989, Hantz, et al 1995, Bates, G.W, 199) that increase in weight and BMI shows overweight or obesity. Weight of women at

reproductive age is important as it also cause the reproductive abnormalities in the women. Many women are diagnosed earlier with endocrine problems, menstrual irregularity and an ovulation. There for women with a low serum level of LH, FSH, and Progesterone indicates that there is problem in the function of hypothalamus or the function of pituitary gland. While an increase in the level of reproductive hormones indicates there is dysfunction in normal production of hormones in the ovaries. As ovaries are main site of production and regulation of female hormones and this endocrine disorder affects the normal mechanism of the ovulation induction and fertility in females. As when there is any type of the defect in the hypothalamus. Then there is effective production of the gonadotropins. As gonadotropins production is effected then they are also not able to stimulate the ovaries. A high serum LH and low serum FSH is an indication of the PCOS. Progesterone level may also be decreased due to the deficiency of luteal phase defect. Increase in prolactin level called hyper prolectemia is also cause of infertility because high level of the prolactin also decreases ovulation process. Other cause which can affect the fertility and ovulation are like endometriosis and bacterial infection in uterine cavity which complicates the other factors in the normal healthy uterine cavity. Therefore along with hormonal disturbance the reproductive tract infections also lead to complication and cause infertility. But hormonal abnormalities contribute more in fertility problems and reduce the stimulating process of ovulation. So when patient came with complication of infertility then a proper evaluation of

hormones should be performed, along with the biopsy of uterine cavity for evaluation of the other diseases. [20]

A complete physical examination and fertility hormonal evaluation including LH, FSH, Progesterone, Estrogen, and Prolactin also other important hormone like Thyroid hormone test should be carried out. Male semen analysis is also important to know the cause of infertility. To diagnose the luteal phase deficiency for low serum level of progesterone is also important and some time there is no cause of infertility and this infertility is unexplained. [21]

### CONCLUSION:

The present study shows the positive effect of clomiphene citrate drug when it was used in women with PCOS. The CC has positive effect on reproductive hormones in women but also induce the ovulation which is abnormally disturbed due to alteration of normal hormonal level. Anovulation is due to many reasons which cause infertility including luteal phase defects and CC has also shows positive impact to address this cause of infertility. Normal levels of prolactin and thyroid hormone are also important for regulation of normal reproduction. So these parameters should also be evaluated. Therefore clomiphene drug can be used in women with PCOS and in other condition which leads to anovulation and hormonal imbalance.

Being an easy availability and low cost medicine it is affordable to patients and it has minimal side effects on patient's health. The major side effect reported with CC is multiple pregnancies. There are many causes which leads to infertility some are primary and some are related to genetics which affects normal reproduction.

Social and economic status also affects the reproduction in females in the form of stress. Many women also have lack of awareness about their fertility days. They don't know how to start their treatment for infertility.

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