

# Evaluation of Female Fertility Hormone Profile in Women with Primary and Secondary Infertility

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**Abstract:** Female fertility hormones; Follicle Stimulating hormone (FSH), Luteinizing Hormone (LH), Prolactin (PRL), Oestradiol (E<sub>2</sub>), and Progesterone (PG) levels were investigated in a population of 80 subjects aged 18-45yrs. Subjects with primary infertility were 30 (37.5%), those with secondary infertility were also 30 (37.5%). The control subjects, which were women in active reproductive years were 20 (25%). The subjects were investigated for the evidence of the interaction of the different hormones leading to infertility. From the investigation, serum PG, E<sub>2</sub> and PRL values increased significantly in both the primary and secondary groups ( $p < 0.05$ ) in the luteal phase when compared to the controls. The values of the hormones are significant for most of the subgroups which constitute evidence of the association of the hormones especially progesterone in luteal phase fertility in the different subgroups of women.

**Keywords:** LH, FSH, PG, E<sub>2</sub>, PRL, Hormones, Luteal and fertility.

## 1. Introduction

For a percentage of adults couples desiring children, infertility is a problem. It is defined as the inability of a sexually active, non-contracepting couple to achieve conception within one or two years of unprotected sexual intercourse (Mosher *et al.*, 1990). Infertility could be primary (when both partners have never conceived in their lifetime) or secondary (inability of couples or partners to conceive after a year when one or both partners have previously had a child or children) (Schmidt *et al.*, 1985). Infertility is often traumatic, whether or not couples already have other living children. Infertility has been steadily increasing overtime in Nigeria compared with what was obtainable in the past (Mosher *et al.*, 1990). The reason is the trend for women to delay child bearing due either to various reasons including education or occupational career.

The ability to become pregnant peaks in a woman's mid-twenties and decreases as the age increases and by age 35-40 years medically it becomes a fertility factor. In addition, the incidence of miscarriage increases with increasing age, nutritional and lifestyle changes. Others are the reproductive organs, which are highly susceptible to free radical or oxidative toxicants and natural ageing as well as hormonal imbalance (Evers, 2002). Hormonal balance is very critical to monthly ovulation and development of the corpus luteum for preparation of the uterus for implantation. Synchronised hormonal changes leading to the release of an egg from an ovary and the thickening of the fertilized egg do not occur because the release of certain hormones is pulsatile and its inadequacy reduces fertility (Aono *et al.*, 1974). Luteinizing hormone, LH and Progesterone, PG insufficiency can be diagnosed and if the PG is low, there is less of an expected increase in temperature during the second half of the cycle after ovulation. Without sufficient Progesterone, the endometrium cannot be prepared for implantation and the fertile ova cannot be converted into the corpus luteum. Follicle Stimulating Hormone, FSH stimulates several follicles to mature and only one becomes dominant during a cycle and LH stimulates ovulation by causing the dominant

follicle to burst and release its eggs into the fallopian tube (Florack *et al.*, 1994).

Hormonal imbalance can be determined by blood tests of reproductive hormone levels. Measuring LH, FSH, Prolactin, PRL, PG and Oestradiol, E<sub>2</sub> at day 2 or 21 can indicate whether or not the hormonal state is compatible with pregnancy (Fuentes *et al.*, 1994). More patients with primary rather than secondary infertility seek medical advice and according to USA National Centre for Health Statistics, 4% of infertile women will not achieve a life birth and the psychological and financial burden that this diagnosis places on couples can be devastating and emotional pain real and intense (Evers, 2002).

Successful conception relies upon the production of healthy sperm and eggs that meet and fuse in a supportive environment. Interruption of any step along these complex pathway results in infertility (Bayer, 1990). For conception to occur in a woman, the reproductive organs (uterus, cervix, vagina, fallopian tube, ovaries, endometrium) have to be in good health as well as balanced reproductive hormones.

## 2. Materials and Methods

### Study Participants

80 subjects (all women), aged 18-45 years in their reproductive stage were recruited for this study. The study protocol was explained carefully to each of them and consent was given to participate in the study.

### Study Design

The subjects were divided into three groups. Group 1 and 2 consists of 30 females each. First 30 females consisted of subjects with primary infertility while the other 30 females consisted of subjects with secondary infertility. The third group of 20 females served as control. Individual consents as well as consent from ethics committee of the institution was obtained before sampling.

The subjects went through some questioning to determine at what stage of the monthly cycle is best suitable for sampling

(Follicular or Luteal). The blood was collected by venepuncture into plain bottle and later separated into another sterile plain bottle after centrifugation at 3000rpm for 30 minutes. The hormones analysed were FSH, LH, PRL, E2, and PG by enzyme immunoassay method for the quantitative concentration in human serum. The mean values

of LH, FSH, PRL, E2 and PG in different subgroups are shown in table 1 below.

### 3. Result

Hormones/ units	Control	Primary Infertility	Sec. Infertility	F value	P value
LH (miu/ml)	10.7±3.91	9.26±8.94	9.31±8.90	0.25	NS
FSH (miu/ml)	7.7±3.3	7.66±7.45	10.5±13.9	0.81	NS
PRL (ng/ml)	12.0±8.04	27.4±27.0	23.6±24.0	2.90	P<0.05
E2 (pg / ml)	7.06±3.83	93.9±52.5	77.9±48.2	25.35	P<0.05
PG (ng /ml)	27.7±3.30	17.7±15.8	13.1±18.0	5.50	P<0.05

Mean and standard Deviation of LH, FSH, PRL, PG and E2 of the different subgroups.

**LH** levels for primary infertile group were the lowest (9.26miu/ml) while secondary infertile group had the highest mean concentration (9.31miu/ml). There was no significant difference (P<0.05) between the control group and other subgroups. **FSH** values were lowest (7.66miu/ml) in primary and highest (10.5miu/ml) in secondary group, control values were intermediate. The values were also not significantly different (P<0.05) when compared to the control group. **PRL** values were highest (27.4ng/ml) in primary and low in the secondary. Control values were lowest (12.0ng/ml). The values were significantly increased (P<0.05) when compared to the control. **PG** levels were intermediate in primary (17.7ng/ml), low in secondary infertile group (13.1ml) and highest (27.7ng/ml) in the controls. The values significantly increased (P<0.05) both in primary and secondary. The levels of **OESTRADIOL** for primary were slightly higher (93.9pg/ml) than the secondary (77.9pg/ml) while control was the lowest (70.6pg/ml). The mean values are significantly increased (P<0.05) in both primary and secondary infertile groups.

### 4. Discussion

The serum concentrations of LH, FSH, PRL, E2 and PG in the primary and secondary infertile patients showed various variations. There were increased levels in the serum PRL, PG and E2 in both the primary and secondary infertile group. The increased levels of serum PRL concentration are consistent with the report of Evers, (2002) that hyperprolactinaemia has several effects that can interfere with ovulation leading to infertility, this includes decrease of GnRH (Gonadotrophin Releasing Hormone), inhibition of LH and FSH release and inhibition of both Oestrogen and Progesterone secretion in the ovary.

The increased levels of Progesterone and Oestradiol in both subgroups of women (primary and secondary) in this study also agree with the report of Daiter, (2007), that hormonal causes for recurrent pregnancy loss are generally considered luteal phase defects. Luteal phase defects are most often thought to result from inadequate progesterone effect on the endometrial lining. According to Daiter, (2007), to successfully implant into the uterus, the embryo must be available during a window limited to a few days/cycle referred to as 'the window of uterine receptivity'. If this window of uterine receptivity is not properly timed with

respect to ovulation, then either infertility or pregnancy loss may occur. The primary regulation for this window of receptivity appears to be hormonal especially progesterone.

Smith *et al.*, (1993) suggested also that progesterone appears to have critical role in implantation and development of normal pregnancy. He noted that limited exposure to progesterone may result in infertility in severe terms or mildly recurrent pregnancy loss. Blascoet *et al.*, (1994) showed that in patients with advanced maternal age (35yrs and above), infertility is more pronounced. This is because, as women age, there is a shift/change in endometrial hormone receptor activity and a changing ovarian performance in regards to hormone production.

Serum LH and FSH levels were low in both subgroups, though FSH levels showed slight increase in the secondary group. This pattern in the study is consistent with study of Knobil, (1980), that the variation in LH and FSH concentrations in women generally depends on a sequence of hormonal events along the gonado-hypothalamic-pituitary axis that could be genetic, hormonal or excessive body fat. Also, according to Larsen, (2003), Herbstet *et al.*, (1971), normal values of LH and FSH that involves presence of ovulation, release of eggs and proper fertilization of egg without the proper level of progesterone for the preparation of the endometrial lining and for implantation results in miscarriage seen as heavier monthly circle even before the uterus is implanted.

### 5. Conclusion

Female fertility can be limited, diminished or destroyed in a number of ways. Women have a finite number of germcells and follicles that are available for a limited period, from menarche to menopause during their lifetime. The process of ovulation is mediated by the interactions of hypothalamic, pituitary and ovarian hormones. Diminished ovaries, fertility organs and interference with ovulation can occur at any one or more combination sites. The oviducts can be distorted or blocked by the consequences of endometriosis or infection. The quality of the ova and spontaneous pregnancy decreases with age.

The reproductive system is particularly vulnerable to the effects of the environment and hormonal effects. The hormones serve as chemical messengers that regulate the reproductive system. This may be due to dramatic events such as disasters that may be man-made or natural.

However, the greatest number of reproductive failures worldwide is greatly influenced by cultural, religious, political and socio-economic factors especially in developing countries where poverty, infection and superstition are commonplace. Caldwell *et al.*, (1990).

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