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Pattern of Reproductive Hormones (Follicle Stimulating Hormone, Luteinizing Hormone, Estradiol, Progesterone, and Prolactin) Levels in Infertile Women in Sagamu South Western Nigeria

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ABSTRACT

Several causes of infertility have been identified all over the world. In Nigeria, infertility is a common reproductive health problem of great concern especially to the female population. Hormonal problems are amongst the important factors in the evaluation of female infertility. This study is mainly concerned with the pattern of the reproductive hormone level in infertile women in South Western Nigeria. The study involve a total of 100 subjects (50 infertile and 50 fertile women as control) and hormone assays were carried out to assess the hormone pattern in these women using ELISA technique. The infertile subjects were married for at least 2 years and the semen analysis of their husbands was normal. The anthropometric details (age, height and weight) of both the test subjects and controls were obtained. The hormonal levels of the infertile women was compared to control groups and a significantly lower LH, FSH, progesterone and estradiol levels (P=0.000, p=0.000, p=0.000 and p=0.005 respectively i.e. p < 0.05) and significantly higher prolactin level were observed in the infertile women (p = 0.012 i.e. p<0.05). Also, 14 out of 50 infertile patients (28%) had hyperprolactinemia, 40 out of 50 infertile (80%) had low progesterone, and 45 out of 50 infertile patients (90%) had low estradiol while all the 50 infertile patients had low gonadotrophins (LH and FSH) levels.

Key words: Infertility, hormones, ovulation, hyperprolactinemia, gonadotrophins.

INTRODUCTION

Infertility is defined as the inability of a couple to achieve conception despite adequate, unprotected sexual intercourse for at least two year duration [6, 3]. WHO in 1991 estimated that between 8 and 12% of couples experienced some forms of infertility during their reproductive lives, thus affecting 50 to 80 million worldwide, out of which 20 – 35 million couples in Africa are expected to experience this problem. This can be extrapolated to 3 - 4 million Nigerian couples suffering from infertility [22]. Available evidence from community based data suggests that up to 30 per cent of couples in some parts of Nigeria are infertile [2].

The results from past studies revealed that up to 20 per cent of women have secondary infertility, mainly from reproductive tract infections [21] postpartum infections [1], septic abortions [19, 18] and sexually transmitted diseases [17]. In female, infertility could be attributed to ovulatory failure or dysfunction (15%), inadequate or

inappropriate sexual exposure, tubal blockage and peritoneal pathology (30 – 40%), uterine causes and male factor (30-40%) [14].

However, Fertility declines with age. It starts declining after age 27 years and drops at a somewhat greater rate after age 35 years [10]. In terms of ovarian reserve, a typical woman has 12% of her reserve at age 30 years and has only 3% at age 40 years [24]. 81% of variation in ovarian reserve is due to age alone [24], making age an important factor in female infertility.

Evaluation of infertility by researchers had revealed several etiological factors like drugs, birth defects, life style (tobacco smoking, alcohol), thyroid disorder, galactorrhoea, and physical examination may reveal obesity, breast secretion, thyroid enlargement, and vaginal abnormality [4]. Anovulatory cycles through hormonal imbalances can be caused by hyperprolactinemia [11] and is usually associated with menstrual and ovulatory disorders like amenorrhea, oligomenorrhea, anovulation, ovulatory cycles with short or inadequate luteal phase and galactorrhea [13].

Previous researchers have emphasized the need for hormonal assay in the evaluation of infertile women [7]. The present investigation evaluates the hormonal profile of infertile women. The aim of the study was to estimate the mean value of FSH, LH, progesterone, estradiol and prolactin levels in infertile women as compared to the control group.

MATERIALS AND METHODS

Study design

The present study was carried out using 50 infertile and 50 control women having normal menstrual cycle (range 28-30 days). Clinical examination revealed that the infertile women have normal genitalia, uterus, and adnexa and the semen analysis of their husband was also normal. Pituitary and ovarian functions were assessed using measurements of FSH, LH, estradiol, progesterone and prolactin hormones.

Anthropometric measurements

The examination of body weight was done by taking weight in kilogram (kg) [23] and height was measured in centimeters [8]. The Body Mass index (BMI) was calculated from the formula; BMI = weight in kilograms / (height in meters)^2 .

Biochemical parameters

Fasting blood was asceptically collected during mid cycle 14 – 16 day by venepuncture. The blood was allowed to clot and the serum was decanted and used for analysis. Haemolysed sera were discarded and fresh specimens obtained. The serum was stored at –20^{o}C and assays were completed within three days. FSH, LH and Prolactin levels were estimated by Immunoenzymatic assay by ELISA [16, 20].The kits were obtained from Immunometrics (UK) Limited, London.

Statistical Analysis

The descriptive characteristics of the group variables were expressed as mean values and standard deviation. Mean values between the groups were compared using paired T tests. Statistical analysis was done using SPSS version 17.

RESULTS

Table 1: Anthropometric parameters

Parameters	Control group n=50	Infertile group n=50	t-value	p-value
Age (years)	37.46 ± 4.35	34.52 ± 6.49	2.74	0.009
Weight (Kg)	63.22 ± 4.75	63.28 ± 6.59	0.068	0.95
Height (cm)	160.08 ± 4.48	161.14 ± 4.39	1.202	0.235
Body Mass Index	24.71 ± 2.08	24.43 ± 2.92	0.59	0.554

Table 1 above gives the detailed anthropometric parameters (age in years, weight in kilograms, height in centimeters, and body mass index (BMI) of infertile and control groups. There is statistically significant decrease in the mean age of the infertile groups ($P < 0.05$), while the changes in the weight, height and body mass index were not significant ($P > 0.05$).

Table 2: Hormonal characteristics of control and infertile group.

Parameters	Control group n=50	Infertile group n=50	t-value	p-value
FSH	5.62 ± 2.21	3.66 ± 1.35	5.53	0.000
LH	4.86 ± 1.64	3.16 ± 1.49	5.19	0.000
Estradiol	0.44 ± 0.12	0.33 ± 0.26	2.96	0.005
Progesterone	34.42 ± 12.1	13.02 ± 9.46	9.11	0.000
Prolactin	293.44 ± 110.89	534.76 ± 90.46	2.60	0.012

Table 2 showed the hormonal characteristics of the control compared to the infertile group. Statistical significant was considered with $p < 0.05$. Serum FSH, LH, estradiol, and progesterone concentrations were significantly lower in the infertile group compared to the control group while the serum prolactin level was significantly higher ($P< 0.05$) in infertile than the control group.

Figure 1

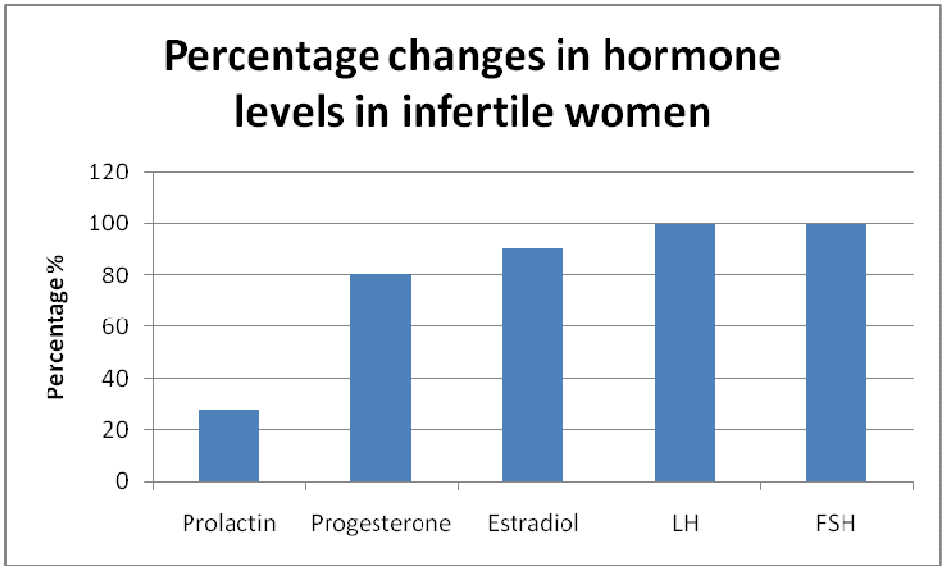

Figure 1 above shows the percentage decrease in the hormone level amongst the infertile women studied. Low levels of progesterone, estradiol and gonadotrophins (LH and FSH) were observed in 80%, and 90% and 100% respectively and higher prolactin levels in 28%.

DISCUSSION

Hormone levels in infertile women had been evaluated by many researchers. Higher level of FSH and LH is rarely found in infertile women with a proper menstrual cycle but lower concentrations are observed [15]. In this study low levels of progesterone, estradiol and gonadotrophins (LH and FSH) were observed in 80%, 90% and 100% of infertile women respectively. The incidence of high prolactin levels (hyperprolactinemia) as the cause of female infertility was reported to be 18% by Avasthi kumkum, et al. [5] and 25% by Mishra et al. [13], however in the present study the incidence was found to be 28%.

Hyperprolactinaemia may occur primarily as a result of normal body changes during pregnancy, breastfeeding, mental stress, sleep; diseases affecting the hypothalamus and pituitary gland; disruption of the normal regulation of prolactin levels by drugs and heavy metals; or secondary to disease of other organs such as the liver, kidneys, ovaries and thyroid [12].

Hyperprolactinemia and low levels of luetinizing hormone (LH), follicle stimulating hormone (FSH) and progesterone may cause anovulation and hence infertility. Both luteinizing hormone (LH) and follicle-stimulating hormone (FSH) are required for follicle development and oestrogen production hence low levels of these hormones may mean that fewer numbers of follicles will develop and there will be no Graffian follicle formation. Normally as follicles develop, estrogen levels rise which helps to stimulate the endometrium.

In these set of infertile women studied, the prolactin level is significantly higher than those obtained amongst the fertile control group women ($p < 0.05$). However the statistically significant ($P < 0.05$) low levels of LH and FSH relative to normal fertile women is suggestive of anovulatory cycle in these women which may be due to hyperprolactinemic state of the infertile women. This is in agreement with the earlier work of Givens et al [9] who reported similar findings.

The relatively low estradiol level observed in these test subjects may be an indication of anovulation consequent of defective follicular development, failure of the formation of Graafian follicle in the ovary, or due to deterioration of Corpus luteum and hence drop in Estrogen levels. Estrogens are normally produced by dominant follicle in the ovary.

CONCLUSION

The present study on FSH, LH and Prolactin levels in infertile women evaluates the hormonal profile of infertile women and confirms etiological importance of hyperprolactinemia in female infertility. Hyperprolactinemia can cause anovulation, irregular ovulation, galactorrhea, oligomenorrhea or amenorrhea in non-pregnant women and stimulates milk production in a pregnant female. Both luteinizing hormone (LH) and follicle-stimulating hormone (FSH) are required for follicle development and oestrogen production. The observed statistically significant decrease in FSH and LH in this study is due to elevated prolactin level in infertile women as compared to the control and this may be responsible for the infertility observed in these set of women. It could be conclusively stated that an inverse relationship tend to exists between plasma prolactin levels and plasma FSH and LH levels in female infertility. Further studies may be to assess the thyroid status of infertile women to ascertain the role of hypothyroidism in hypreprolactinemic infertile women. Also the bone density may be studied in hyperprolatinemic infertile female to detect accompanied osteoporotic changes in the bones. Magnetic resonance imaging (MRI) should be an additional investigative procedure to completely diagnose cause of infertility as this will rule out or detect pituitary tumour and as well determine its size.

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