

Evaluation of serum Cortisol Level in Infertile Women

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Abstract

Cortisol hormone is a glucocorticoid hormone produced in the zona fasciculata of adrenal cortex, its secretion is regulated via HPA axis. The study was planned to determine serum cortisol level in infertile women attending family planning clinic in Azady Teaching Hospital in Kirkuk governorate. This case control study done on 60 infertile women and 30 fertile women in the same age range, the infertile women were divided in to two subgroups according their BMI. Sample collection was done by obtaining four ml of blood at 9 AM in the preovulatory phase from all study groups, serum cortisol were measured by using ELISA technique. The results of this study showed that serum cortisol level in infertile women were significantly higher than fertile women, also its concentration in obese infertile women was significantly higher than lean infertile women furthermore, serum cortisol level was significantly higher in infertile lean women in comparison to fertile non obese women. on conclusion both stress and obesity may have a role in elevation of cortisol hormone in infertile women.

Keywords: Cortisol hormone, Infertility, Azady Teaching Hospital

Introduction

Cortisol is a steroid hormone secreted by adrenal cortex, like other steroid hormones, cortisol act via intracellular receptor to regulate gene expression. Most cortisol (95%) is transported through the circulation bound to plasma proteins 80% bound to cortisol binding protein, 15% attached to albumin and 5% is free and functional (1). Free cortisol is a physiologically active hormone that is not attached to plasma protein therefore can act straightly on tissue locale, plasma has two cortisol-binding protein one is high inclination, low capacity α_2 globulin named transcortin or cortisol binding globulin (CBG), and the other is low affinity high capacity protein, albumin.(2)

ACTH is the trophic hormone of zona fasciculata and reticularis and the anterior organizer of cortisol and androgen outputting by the adrenal cortex. ACTH in turn is regulated by the hypothalamus and central nervous system via neurotransmitters and corticotrophin releasing hormone(CRH) and arginine, vasopressin. The neuroendocrine control of cortisol secretion done by episodic secretion of cortisol and the circadian rhythm of ACTH and stress responsiveness of the hypothalamic-pituitary adrenal axis(HPA) and feedback inhibition by cortisol of ACTH secretion(3).

The physiological effects of cortisol on reproductive system include suppresses the secretion of anterior pituitary hormones, LH and FSH (1). On the another hand, in recent years evidence had been collected that cortisol

hormone is essential for normal ovulation (6,7,8)

Subfertility is the incompetency to conceive after 1 year of unprotected intercourse(4). Subfertility has four main causes which is male factor, ovulatory factor, pelvic and cervical factor(5).

In ovulatory dysfunction ovulation may be perturbed by abnormalities with hypothalamus, anterior pituitary gland or ovaries hypothalamic disorder may be due to life style for intestines, exercise, eating disorder or stress(4).

Stress hormones specially cortisol cause fat metabolism, energy consumption, increase heart rate, respiratory rate also have effect on immune and reproductive system (9) Increase cortisol hormone in case of stress is considered one of the causes of failure of ovulation(10)

Subject and Methods

Across sectional case control study was carried out in Azady Teaching Hospital (Family planning center) Kirkuk governorate –Iraq, from April 2012 –June 2014. Ethical permission was taken from committees of the hospital. The study was performed on 60 infertile women with ovulatory problems and 30 fertile (control) women, all infertile women were diagnosed by consultant gynecologist in the same center women with abnormal thyroid and prolactin hormone were excluded from the study furthermore, all infertile women were with normal oviduct and ovaries

Body mass index (BMI) was reckoned by weight in kilogram divided by high in meter square.

Four ml of blood (pre ovulatory phase) were taken at 9 am under sterile condition the serum were separated and stored at -10C until the analysis for cortisol hormone by using ELIZA kit IBL international (Germany) with detection range (0.75-200 Mg/dl).

All data were adduced as a mean and standard deviation (SD). Unpaired student T test was used to compare between means p value ≤ 0.05 was considered significant throughout the study.

Results

Across sectional case control study involved 60 infertile women and 30 healthy women, there was in significant different in age between the two groups while BMI in infertile women was significantly higher than fertile women table (1). Regarding serum cortisol hormone concentration there were a significant different in its concentration between infertile and fertile women(table1).

The infertile women were divided in to two subgroups, infertile women with BMI > 30 and infertile women with BMI < 30 , there were a significant different in serum cortisol concentration between these two subgroups (Table 2).

Cortisol hormone in infertile lean women were significantly higher than fertile women table (3)

Discussion

The results obtained from this study showed that there were as significant decrease in serum concentration of cortisol hormone in infertile women as compare with fertile control group $p > 0.001$ this result is in consist with a study done by albandar in Iraq (11)

which referred serum and salivary cortisol level infertile women (primary and secondary) were significantly higher in comparison with fertile women in the same age. Moreover, another recent study in Iran(12) demonstrate that cortisol hormone level effect the IVF results where better oocyte type can be obtained from women with low cortisol level.

A couple that is trying to conceive will unsuspectly experience feeling of frustration and demoralizing if pregnancy is not conveniently achieved these feeling may cause elevation of cortisol hormone by activation of neurons that secrete corticotrophin-releasing hormone ,evidence has been collected that there is strong association between physiological status of the couples and fertility (13,14,15). In a study done by Lapane et al which demonstrate that women with history of depression were at great risk of infertility (16).

In the present study the infertile women were divided in to two subgroups (Infertile women with BMI < 30 and infertile women with BMI > 30 , cortisol hormone concentration were significantly higher $P > 0.001$ in obese infertile female in comparison with lean infertile female this finding go on line with Bjorntop and Rosmond study who suggest that disturbance in hypothalamic-pituitary-adrenal axis may be responsible for obesity(17). Furthermore, in another case-control retrospective study (18) which referred that hyper activity of the HPA axis is the main reason for obesity, the etiology behind elevation of cortisol hormone in obese patient is that subcutaneous adipose tissue secrete cortisol hormone by 11 beta – hydroxysteroid dehydrogenase type 1(11 beta-HSD1) which regenerate cortisol from cortisone and contribute

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to whole body cortisol regeneration (19).

Infertile women may suffer from physiological stress and this physiological stress could be one of the possible causes of obesity in infertile women since in stress the level of cytokines, leptin, IL1 receptor antagonist and IL6 are elevated and increase cytokine production could be linking point between stress and obesity(20) .

By comparing serum cortisol hormone between infertile lean women and fertile women cortisol level in infertile lean women were significantly higher than fertile control women this result is in consistent with Anderson hypothesis (6) who suggest that high cortisol

hormone level in pre ovulatory phase is essential for ovulation.

The result of our study and other studies (11,12,21) are consistent and supporting the notion that stress as assisted by cortisol hormone may adversely impact on women's reproductive function.

Conclusion

Both stress and cortisol level elevation may have a significant role in female infertility.

Recommendation;-

It is recommended to carry out further studies for estimation the physiological role of follicular cortisol hormone and its role in ovulation.

Table (1) show age, BMI, Cortisol hormone in both fertile and infertile women.

Parameters	fertile Women(n=30)	Fertile Women(n=60)	P value
Age(year)	35.5±1.8	32.8±3.22	NS
BMI kg/m ²	27±4.1	30.1±5.1	P >0.01
Cortisol hormone Mg/dl	9.1±4.01	15±2.51	p>0.01

Table (2) illustrates comparison between BMI and serum cortisol hormone in infertile women with BMI<30 and infertile women with BMI> 30.

Parametars	Infertile women with BMI<30 n=30	Infertile women with BMI>30 n=30	P value
BMI kg/m ²	28.1±2.08	32.5±4.05	p>0.01
Cortisol hormone Mg/dl	13.1±2.12	17.±2.05	p>0.01

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Table (3) Shows cortisol hormone in fertile and infertile women with BMI<30

Parameters	Fertile control women(n=30)	Infertile women with BMI<30(n=30)	P value
BMI kg/m ²	27±4.1	28±2.08	NS
Cortisol hormone Mg/dl	9.01±4.01	13.1±2.12	p>0.001

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