Original Research Article

Correlation of Thyroid Hormones with FSH, LH and Prolactin in Infertility in the Reproductive Age Group Women

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Abstract

Introduction: Measurement of prolactin and thyroid hormones, especially thyroid stimulating hormone (TSH), has been considered an important component of infertility work up in women. Thyroid dysfunctions interfere with numerous aspects of reproduction and pregnancy.
Aim: To correlate thyroid hormones level with FSH, LH and prolactin in infertility in the reproductive age group women.
Materials and methods: This study includes 100 infertile women who attended infertility clinic of our institute along with 50 fertile women as a control group between age group of 20 to 40 years. Out of 100 infertile women, 70 were of primary infertility and 30 of secondary infertility. Thyroid hormones and infertility hormones level is measured from all participants by chemiluminance immunoassay.
Results: Prolactin and TSH were positively correlated with each other. They were also negatively correlated with LH, FSH and T3 in infertile groups. Therefore we can say that hyperprolactinemia and hypothyroidism plays key role in etiopathogenesis of infertility.
Conclusion: There was a higher crude prevalence of hypothyroidism and hyperprolactinemia in the infertile women as compared to the fertile ones in the control group.

Key words

Infertility, Thyroid hormones, FSH, LH, Prolactin.

Introduction

Infertility is defined as inability to conceive after at least one year of unprotected coitus [1].75% of perfectly normal couples will conceive within a period of one year. 85% of normal couples conceive within one year and 93% within 2 years [2].

Hormonal disorders of female reproductive system are comprised of a number of problems resulting from dysfunction of hypo-thalamic-pituitary ovarian axis. These relatively common disorders often lead to infertility [1]. Hormonal disorders of female reproductive system are comprised of a number of problems resulting from aberrant dysfunction of hypothalamic pituitary-ovarian axis. These relatively common disorders often lead to infertility. Thyroid dysfunction which is quite prevalent in the population affects many organs including male and female gonads, interferes with human reproductive physiology, which reduces the likelihood of pregnancy and adversely affects pregnancy outcome, thus becoming relevant in the algorithm of reproductive dysfunction [3]. However, many infertile women present with normal menses despite a raised serum prolactin level. Pituitary hormones such as TSH, prolactin or growth hormone may act synergistically with FSH and LH to enhance the entry of non-growing follicles into the growth phase [4]. Morphological changes observed in the follicles in hypothyroidism can be a consequence of higher prolactin production that may block both secretion and action of gonadotropins [5, 6].

The prevalence of infertility is estimated to be between 12 and 14%. It thus represents a common condition, with important medical, economic and psychological implications4. Proper evaluation of these disorders involves a multidimensional diagnostic approach.

Materials and methods

A cross sectional study was conducted in Department of Biochemistry in association with Department of Gynecology at RNT Medical College, Udaipur, Rajasthan, India.

Total 100 infertile women and 50 normal fertile women volunteers were selected on OPD basis between age group of 20 to 45 years. Out of 100 infertile women, 70 were of primary infertility and 30 of secondary infertility.

Participants were selected on the basis of detailed history, clinical examination and laboratory investigations. Detailed history of participants including age, menstrual history, obstetric history, history of any medications, addictions, was taken.

Inclusion criteria

- Infertile women age between 20 to 45 years.
- Normal fertile women age between 20 to 45 years.

Exclusion criteria

- Patient who received medication that could alter Thyroid function test or patients who suffering from DM, HT and any other chronic illness.

Collection of blood sample

Fasting 4 ml venous blood samples were collected from all participants in there early follicular phase of menstrual cycle i.e. between days 3rd to 5th in plane bulbs.

Unique ID was given to all participants and same ID was mentioned on sample bulb to hidden identity of patients.

Serum was separated after 1 hour by centrifugation at 3000 rpm for 10 minutes, and was tested for following parameters by chemiluminance technology.

- Serum FT3 (Reference range:0.8-2 ng/ml)
- Serum FT4 (Reference range:6-12.23 microg/ml)

- Serum TSH (Reference range:0.5-5 microIU/ml)
- Serum FSH (Reference range:3.85-8.78 microIU/ml)
- Serum LH (Reference range:2.12-10.89 microIU/ml)
- Serum Prolactin (Reference range:2-29 microIU/ml)

Obtained results of case group were compared with control group for determination of difference of significance. P-value was calculated by using online student t-test calculator. P-value less than 0.05 were considered as significant.

Results

The current study was designed to correlate thyroid status in infertile women and its correlation with serum prolactin, LH and FSH. The individuals were divided in 2 groups according to fertility i.e. Group I Infertile women (cases), Group II Normal healthy fertile women (controls).

Cases are further sub classified as Group IA (Primary infertile women) and Group IB (secondary infertile women). Age wise distribution of participants was as per **Table – 1**. Thyroid function status in the study population was presented in **Table - 2**.

Table - 1: Age wise distribution of participants.

Group	Number (n)	Age group (Year)	Mean age (Year)
Group 1 (Infertile)	100	20-45	23.525 ± 2.48
Group 1A (Primary Infertile)	70	20-45	27.5 ± 3
Group 1B (Secondary Infertile)	30	20-45	24.6 ± 5.3
Group 2 (Control)	50	20-45	23.525 ± 2.48

Table - 2: Hormonal status in the Cases and Controls.

Parameter		Cases (n=100)			Controls (n=50)		
		Euthyroid (n=74)	Hyperthyroid (n=8)	Hypothyroid (n=18)	Euthyroid (n=38)	Hyperthyroid (n=6)	Hypothyroid (n=6)
FT3	**pg/ml**	2.45±0.6	4.6±0.55	1.92±0.2	2.8±0.23	5.05±0.31	1.01±0.14
FT4	**ng/ml**	1.4±0.4	2.9±0.64	0.54±0.04	1.5±0.77	3.4±0.33	0.35±0.11
TSH	**µIU/L**	4.1±1.6*	0.14±0.05	9.23±0.79*	2.95±0.8	0.15±0.4	7.21±0.45
Prolactin	**ng/ml**	28.9±17*	18.01±1.06*	67±11*	13.6±6.0 9	8.1±3.2	29.7±2.01
LH	**IU/L**	5.92±2.7*	5.5±1.29*	3.21±1.0*	8.2±2.04	7.39±0.85	9.9±2
FSH	**IU/L**	3.94±2.64*	3.78±0.75*	2.55±2.08*	5.96±1.6	5.69±1.01	12.2±1.3

Cases and control further divided in Euthyroid, Hyperthyroid and hypothyroid according to their thyroid hormones status. Most of the infertile women 74/100 (74%) and control 38/50 (76%) were euthyroid. The prevalence of hyperthyroidism in the cases and the controls were 8/100 (8%) and 6/50 (12%), respectively.

Hypothyroidism was seen in 18/100 (18%) of the infertile women whereas in the control group it was found to be 6/50 (12%). The crude prevalence of hypothyroidism was higher when compared to hyperthyroidism in the infertile group.

Significantly higher serum TSH levels were noted in the infertile cases with euthyroid ($p<0.5$) and hypothyroidism ($p<0.01$) when their distributions were compared to their respective control groups. The rise in serum FT4 and FT3 in the infertile group with hyperthyroidism was

found to be non-significant as compared to the control group with hyperthyroidism.

The mean serum prolactin concentration in the infertile cases with euthyroid was significantly higher ($p<0.001$) than the control group with euthyroid. The infertile women with hypothyroidism had significantly higher prolactin levels than the other three groups (the controls and the infertile subjects with euthyroid and hyperthyroidism) ($p<0.001$).

There was also higher level of prolactin in hypothyroid control as compared to euthyroid and hyperthyroid control.

Discussion

Thyroid dysfunction is a condition known to reduce the likelihood of pregnancy and to adversely affect pregnancy outcome. Data on the relationship between thyroid disorders and infertility remain scarce and the association with a particular cause of infertility has not been thoroughly analyzed [7].

The increase in prolactin secretion can be physiological e.g. during pregnancy and lactation or pathological due to hypothalamic and pituitary diseases, or it can be iatrogenic. Hyperprolactinemia induces suppression of the hypothalamic-pituitary-gonadal axis and resistance of the ovary to gonadotropin action, which results in amenorrhea and lack of ovulation [8].

Serum levels of Prolactin and TSH increased in infertile women as compared to control, the differences among three groups being highly significant ($P< 0.001$). Serum Prolactin levels were found to be strongly correlated with TSH levels in primary infertile women and Secondary infertile women and this correlation was statistically significant ($P< 0.001$). As per the study, we observed a greater percentage of infertile women with hypothyroidism exhibiting hyperprolactinemia (40.7%). These findings in our study strongly correlate with the findings of study by Goswami Binita, et al. (2009), they found 46.1% infertile women with hypothyroidism had hyperprolactinemia [9].

Kumkum, et al. (2006), in their study incidence of hypothyroidism in hyperprolactinemic women was 25.50% (13/51). So, a positive correlation of 1:4 was found between hypothyroidism and hyperprolactinemia [10].

In our study serum LH and FSH was decreased in infertile women as compared to control, the differences among three groups being highly significant ($P< 0.001$). LH and FSH both are negatively correlated with prolactin.

Azima Kalsum, Samina Jalali (2002), in their study shows a significant decrease in serum LH in follicular, ovulatory and luteal phase in hyperprolactinemic women having primary and secondary infertility. Significantly ($P<0.05$) low serum FSH levels were observed in ovulatory phase in women reported with primary infertility. Similarly significant ($P<0.05$) decrease in serum FSH in luteal phase in hyperprolactinemic women reported with secondary infertility was observed [11]. Yamaguchi, et al. (1991), found decreased LH secretion in nocturnal hyperprolactinemic women [12].

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The correlation between TSH and prolactin was studied in 2006. It was observed that incidence of hypothyroidism in hyperprolactinemia was 25.5%. The ratio of proportions between hyperprolactinemia and hypothyroidism was 5:1 i.e. in every four hyperprolactinemic patients one had hypothyroidism [13]. Our study revealed a significant association between abnormal menstrual patterns, with hyperprolactinemia and hypothyroidism in the infertile group ($p<0.001$).

Conclusion

In the present study, there is high prevalence of hypothyroidism in infertile female. These disorders may lead to menstrual irregularities resulting in infertility. This is also associated with hyper prolactinemia and these patients are

commonly associated with ovulatory failure. Hence, assessment of serum TSH and prolactin levels are mandatory in the work up of all infertile women, especially those presenting with menstrual irregularities.

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