



Study on Thyroid Hormone, FSH, LH and Prolactin Levels in Patients with Primary Infertility: A Hospital Based study

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Abstracts

The thyroid dysfunction, which is quite prevalent in the population, affects many organs including male and female gonads, thus interfering with the human reproductive physiology. Prolactin has suppressive effect on the pituitary –ovarian axis and may result in amenorrhea or oligomenorrhea due to anovulatory cycles. Hyperprolactinemia is a common problem in reproductive dysfunction, affecting about one third of infertile women. A positive correlation was found between TSH and prolactin i.e elevated TSH levels were associated with elevated prolactin levels in infertile patients. So TSH screening of all females of early reproductive age group should be done so as to detect subclinical thyroid problem and to prevent infertility risk.

Keywords: *Thyroid profile, FSH, LH and Prolactin.*

Introduction

The thyroid dysfunction, which is quite prevalent in the population, affects many organs including male and female gonads, thus interfering with the human reproductive physiology. 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.¹The function of thyroid hormones include modulation of carbohydrates, proteins and fat metabolism, gene expression and also sexual and reproductive function,² thus when the thyroid hormone gets out of balance, many body functions are affected. This is why hypothyroidism can mimic many other diseases.

Hypothyroidism is caused by insufficient production of thyroid hormones by the thyroid gland. Hypothyroidism has many effects on reproductive system development and function. The reproductive tract appears to develop normally in cretins, thus hypothyroidism during fetal life does not appear to affect the normal development of the reproductive tract.³ Hypothyroidism beginning before puberty causes a delay in onset of puberty followed by an ovulatory cycle in women. In some cases juvenile hypothyroidism, precocious puberty and galactorrhoea have been reported.⁴ In women hypothyroidism is associated with delay in the onset of puberty, anovulation, amenorrhea, polymenorrhea, menstrual irregularities, infertility and increased frequency of spontaneous abortions.

It was suggested that these alterations may be caused by decrease in gonadotropin secretion, due to hyper prolactinemia (prolactin levels are directly correlated with TSH levels).

In hypothyroid women changes in menstrual cycle suggests that thyroid disorders are associated with ovarian hyperactivity like hyperestrogenemia, hyper prolactinemia, impaired fertility. The effects of thyroid hormones on the impaired function of reproductive and to great extent is thought to be due to changes in TSH level, whose secretion overlaps with FSH, LH and prolactin and thus it may have overlapping function.⁵ Hyperthyroidism is due to overproduction of thyroid hormones. The most common underlying cause of hyperthyroidism is Graves's disease. Children born with neonatal Graves's disease have no defects in the reproductive system that can be related to this disease. Hyperthyroidism occurring prior to puberty has been reported to delay the onset of menses.⁶ Similar to hypothyroidism, hyperthyroidism may also result in menstrual abnormalities in adult women. The more common manifestations are hypo, poly and Oligomenorrhoea; moreover hyperthyroidism in women has been linked to reduced fertility. Reported studies indicate that menstrual disturbances in hyperthyroidism are 2 times more frequent than in normal population.

The menstrual pattern is influenced by thyroid hormones directly through impact on ovaries and indirectly through impact on SHBG, PRL, GnRH secretion and coagulation factors. Treating thyroid dysfunction can reverse menstrual disorders thus improving fertility.⁷ A positive correlation has been seen between hyperprolactinemia and hypothyroidism. This is due to the fact that Thyrotropin Releasing Hormone (TRH) has similar effect on prolactin gene and thyroid gland and leads to release of both hormones i.e prolactin and TSH.⁸ The present study was aim to the correlation between TSH, FSH, LH and prolactins in infertile women and also comparison of these hormones levels in fertile & infertile women.

Material and Methods

The present study was conducted in the Department of Pathology, Heritage Institute of Medical Sciences, during the period from July 2015 to March 2015. The study protocol was approved by the Ethics committee of Heritage Institute of Medical Sciences. The present study consists of total 55 women subjects between the age group 19-42 years who are further subdivided into two categories; **Controls:** Includes total 25 healthy women and **Cases:** Consists of 30 (Out of which 15 are hypothyroid and 15 are hyperthyroid) thyroid disorders women. After written informed consent, 12-14 hour fasting venous blood samples were collected and Serum was separated after 1 hour by centrifugation at 2500 rpm for 8-10 minutes, and was tested for following parameters. Serum Tri-iodothyronine (T3) ; Serum Tetraiodothyronine (T4); Serum Thyroid stimulating hormone (TSH) ;Serum Follicle stimulating hormone(FSH) ;Serum Luteinizing hormone (LH) and Serum Prolactin (PRL). All values were expressed as mean \pm SD. We used student t-test and pearson's correlation coefficient to find the statistical significance. A P-value <0.05 was to be considered statistically significant.

Result and Discussion

The present study shows the Thyroid function status in the study population is presented in table-1. A control consists of healthy subjects while Cases further divided in Hyperthyroid & hypothyroid according to their thyroid hormones status. The prolactin and LH levels are increase significantly (<0.01) with normal FSH levels. All 15 patients have shown hypothyroid symptoms and menstrual irregularities. Cases with patients have shown hyperthyroid profile. FSH levels though normal, it is significantly lowered, as compared to hypothyroidism and have very high LH values with normal Prolactin levels. All the 15 patients have shown hyperthyroid symptoms and menstrual irregularities. Table-2 showed correlation coefficients (r) in Primary infertility

where as Prolactin shows positive correlation ($r=0.82$) with TSH and negative with FSH & LH. LH also shows positive correlation with FSH ($r=0.37$). The magnitude of serum prolactin is proportional to the increase in thyroid stimulating hormone values and basal gonadotrophin concentrations are also elevated in this condition.⁹ Review of literature and clinical evidence show that thyroid disorders in women are associated with frequent menstrual disturbances, impaired

fertility and unsuccessful pregnancy.^{10,11&12} Animal studies have shown that hypothyroidism may lead to serious disturbances not only in development of the ovarian follicles but also their activity.^{13,14&15}

According to the result obtained in the present study, in hypothyroid women, enhanced basal levels of prolactin and LH, normal levels of FSH are obtained. It results in alteration of LH: FSH ratio from 1: 1 to 6: 1.

Table-1: Shows the Hormonal status between Cases and Controls.

Parameters	Controls (Mean±Sd)	Cases	
		Hypothyroid (Mean±Sd)	Hyperthyroid (Mean±Sd)
Age (Years)	22.52 ± 2.47	28.57 ± 1.92	28 ± 2.14
T3(ng/ml)	1.24 ± 0.02	0.54±0.2**	2.11 ± 0.3**
T4(μ/ml)	141.1±12.3	47.2±2.04**	164.01 ±10.5*
TSH(μIU/ml)	3.35±0.02	11.12±0.79**	0.23±0.01**
FSH(mIU/ml)	4.56 ± 1.8	6.01 ± 2.0*	2.02 ± 0.12**
LH(mIU/ml)	6.02 ± 1.2	40.01 ± 8.01**	51.42 ± 8.01**
PRL(ng/ml)	10.4 ± 1.06	22.01 ± 2.04**	11.02± 2.03*

Note: (**Statistically significant at $p<0.01$ and * statistically not Significant)

Table 2: correlation coefficients (r) in Primary infertility:

Variables	TSH	FSH	LH
Prolactin	$r= 0.82^*$ $P= 0.000$	-0.22 0.08	-0.59 6.3
FSH	$r= -0.16$ $P= 0.19$	-	-
LH	$r= -0.45$ $P=2.1$	0.37* 0.00	-

*Prolactin shows +ve correlation($r=0.82$) with TSH and -ve with FSH & LH.

*LH also shows +ve correlation with FSH ($r=0.37$)

This study confirms the published observations on elevated LH and prolactin levels on hypothyroid women, experimental studies on rats that suggest that formation of poly cystic ovaries in hypothyroid rats is associated with high levels of prolactin and LH. The present study also indicates that altered hormonal status of gonadotropins may be responsible for the irregular menstrual cycle, and also may predispose to development of polycystic ovarian syndrome in hypothyroid women. According to Zahringers et al¹⁶, LH secretion was increased in all hyperthyroid patients, while FSH secretion was increased in

hyperthyroid men only. No changes in prolactin secretion were shown.

In the present study, the mean LH levels in hyperthyroid women are significantly higher than in euthyroid women, where as prolactin levels are normal. FSH levels though normal (<20 mIU/ml), is significantly lower than in hypothyroid women. The mechanism of increase in serum LH and fall in FSH in hyperthyroid women and the causes of menstrual irregularities in hyperthyroid women are not very clear. Thyroid function test and especially TSH is recommended for each hyperprolactinemic patient, to identify patients

with hyperprolactinemia which is caused by hypothyroidism. Hypothyroidism in females, maternal hypothyroidism and sub-clinical hypothyroidism, should be extensively studied as secondary causes of hyperprolactinemia. Moreover some studies should address iodine deficiency disorder and hypothyroidism and their relations to infertility.

From the present study we observed proportional increase in TSH and serum Prolactin in relation with decreasing T3, T4, LH and FSH in infertile women. There was significant positive correlation of Prolactin with TSH. LH & FSH were decreased with increasing Prolactin. 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. So it was concluded that there is a positive correlation between TSH and Prolactin.¹⁷

Conclusion

The present study suggest that there is an increased levels of prolactin and LH with normal FSH in hypothyroid cases, indicating their susceptibility for the development of polycystic ovarian syndrome. There is a normal level of prolactin and FSH along with increase LH levels in hyperthyroid cases. In both hypo and hyperthyroidism menstrual irregularities and altered gonadotropin patterns are observed, indicating that the thyroid hormones play an important role in reproductive physiology. Long standing hypothyroidism may develop ovulatory dysfunction, and hyperprolactinemia. So identifying and treating hypothyroidism at an earlier stage before the appearance of ovulatory dysfunction and hyperprolactinemia, can have potentially great preventive value. A positive correlation was found between TSH and prolactin i.e elevated TSH levels were associated with elevated prolactin levels in infertile patients. So TSH screening of all females of early reproductive

age group should be done so as to detect subclinical thyroid problem and to prevent infertility risk.

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