

CORRELATION OF PROLACTIN LEVELS WITH THYROID HORMONE LEVELS IN THYROID DISORDERS, INFERTILITY AND MENSTRUAL DISORDERS

Shidhaye Nikhil P¹, Pratinidhi SA², Savla Khushboo S³, Zope RD⁴, Sontakke Alka⁵

^{1,3}Second Year MBBS Student, ²Professor and Head, Department of Biochemistry, ⁴Assistant Professor, Department of Pathology, ⁵Director Administration, Maharashtra Institute of Medical Education and Research, Talegaon Dabhade, Pune, Maharashtra, India.

ABSTRACT

Introduction: Prolactin and Thyroid hormones are regulated through an interrelated pathway. The increased level of TRH in hypothyroidism stimulates the release of prolactin. Prolactin and thyroid disorders are associated in a variety of conditions. **Aims:** To find if any correlation exists between Prolactin and Thyroid hormone levels in thyroid disorders. **Methods:** It was an observational, retrospective study. Serum levels of T3, T4, TSH and Prolactin were estimated by ELISA kits. The data was collected from registers and analyzed for correlation. **Results:** A significant proportion of hyperprolactinemia cases are Euthyroid. Hyperprolactinemia is associated with both hypothyroidism as well as hyperthyroidism. It is more prevalent in hypothyroid cases. Prolactin has a positive correlation with TSH in both hyperthyroidism and hypothyroidism. **Conclusion:** Prolactin has a positive correlation with TSH in both hyperthyroidism and hypothyroidism. Both prolactin and thyroid hormone levels should be estimated in cases of infertility, menstrual disturbances and thyroid disorders.

KEYWORDS: Hyperprolactinemia; Hyperthyroidism; Hypothyroidism.

INTRODUCTION

Prolactin (PRL) is a peptide hormone secreted by anterior pituitary that plays a pivotal role in a variety of reproductive functions. It is an essential factor for normal production of breast milk following childbirth. Furthermore, prolactin negatively modulates the secretion of pituitary hormones responsible for gonadal function, including luteinizing hormone and follicle-stimulating hormone [1]. Synthesis of Prolactin is done by lactotrophs and the gene for its synthesis is located on chromosome 6. Estrogen and Thyrotropin Releasing Hormone (TRH) are positive modulators whereas Dopamine acts as a negative modulator. Progesterone acts as an inhibitor [2].

TSH and PRL secretion in man is controlled by an interrelated pathway. However, although a common regulatory mechanism is involved, the sensitivity of Pituitary thyrotrophs and lactotrophs differs for common stimulatory and inhibitory substances [3]. The stimulatory effect of TRH is possibly through changes in the number of TRH receptors on lactotrophs as well as alterations in

dopaminergic neurotransmitter system [4]. TRH also functions to cause the release of Thyroid Stimulating Hormone (TSH) from the pituitary which is involved in the regulation of the thyroid hormones Triiodothyronine (T3) and Tetraiodothyronine (T4). T3 has a negative feedback on prepro TRH gene expression [5]. Thus, the reduction in the levels of T3 and T4 as seen in hypothyroidism causes the stimulation of TRH hormone in turn leading to an increased release of Prolactin as well. Furthermore, prolactin elimination from the systemic circulation is reduced in hypothyroidism, which contributes to increased prolactin concentration. This suggests that a correlation exists between hypothyroidism and hyperprolactinemia due to TRH [6]. Some studies have also shown that the serum PRL level in patients with hyperthyroidism is higher than in normal individuals and a percentage of patients with hyperthyroidism suffer from hyperprolactinemia [7]. Thus in patients with hyperprolactinemia, it is advisable to consider thyroid dysfunction as an adjustable underlying cause.

Hyperprolactinemia is the most prevalent disorders in the hypothalamic pituitary axis [8]. Both, Prolactin and Thyroid disorders show association in conditions ranging from infertility, menstrual disturbances, anovulatory cycles, Polycystic Ovarian Disease (PCOD), galactorrhea to female androgenic alopecia [9, 10, 11].

With the help of simple diagnostic procedures, prompt identification and subsequent correction of underlying



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Correspondence: Shidhaye Nikhil, Second Year MBBS Student, Maharashtra Institute of Medical Education and Research, Talegaon Dabhade, Pune, Maharashtra, India. Email: nikhil.shidhaye@gmail.com

hormonal disorders in such cases, these conditions can be improved. Hence this retrospective hospital based study was undertaken.

Aims & Objectives:

1. To compare the levels of serum Prolactin and Thyroid Hormones (T3, T4 & TSH).
2. To find if any correlation exists between Prolactin and Thyroid hormone levels in thyroid disorders.

MATERIALS AND METHODS

Study design: The current study was an observational hospital based study

Ethics approval: Study was approved by the Institutional Ethics Committee and informed consent was taken from the participants

Study location: Department of Biochemistry, Maharashtra Institute of Medical Education and Research, Talegaon Dabhade, Pune

Study period: It was carried out from January 2017 to May 2017 (5 months)

Sample size: Three hundred

Inclusion criteria: Involving 300 subjects who were suspected cases of thyroid disorders, infertility and menstrual disorders

Exclusion criteria: Any history of thyroid surgery or being on thyroid medications. Confirmed cases of tumors of pituitary

Methodology:

Sample collection: Two ml of blood was collected in plain container and was used for estimation of

Serum Prolactin, total T4, total T3 and TSH values by ELISA by Standard Kit (AccuBind) [11].

The normal ranges of thyroid hormone profile and PRL are shown in Table1.

Statistical analysis: The data collected was analyzed using Excel 2007 and appropriate statistical tests were used. Pearson’s correlation coefficient was calculated.

Table 1. Normal Ranges of Prolactin and Thyroid hormone levels.

Prolactin	1.2-20ng/ml
T3	0.52-1.85 ng/ml
T4	4.8-11.6µg/ml
TSH	0.39-6.16µIU/ml

RESULTS

Table 2. Distribution of thyroid cases

	Hypothyroid		Euthyroid		Hyperthyroid		Total
	n	%	n	%	n	%	
Euprolactinemia	13	4.33	178	59.33	6	2	197
Hyperprolactinemia	14	4.66	85	28.33	4	1.33	103
Total	27	8.99	263	87.66	10	3.33	300

Thus, 5.99% (n=18) of the total cases have hyperprolactinemia associated with thyroid disorders.

Correlation of Prolactin with Thyroid Hormones in Hypothyroid cases:

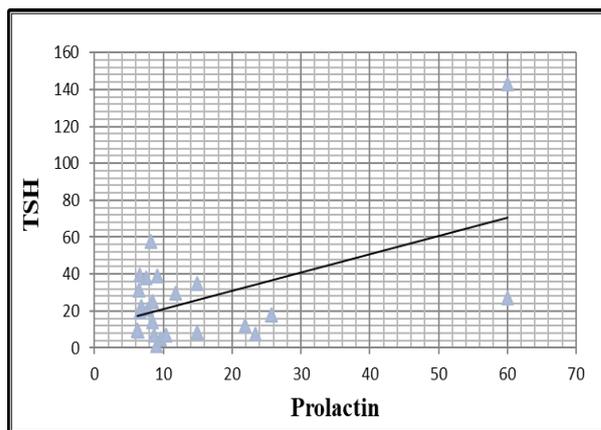


Figure 1a. Correlation of prolactin with TSH (r= 0.53)

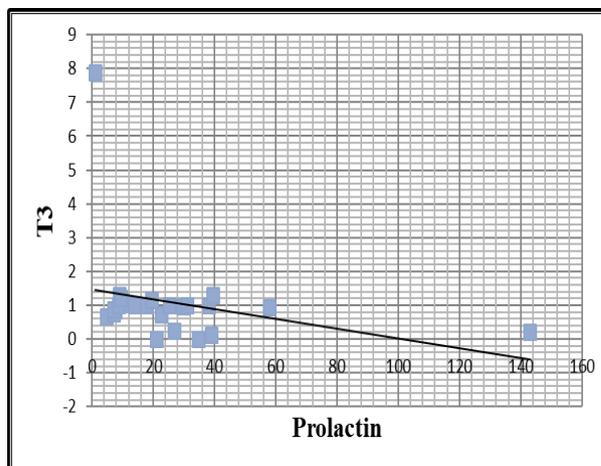


Figure 1b. Correlation of Prolactin with T3 (r= -0.27)

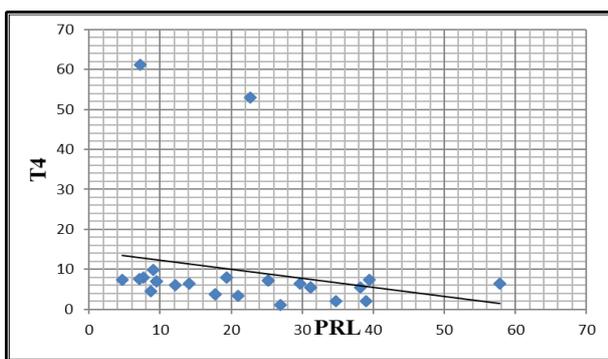


Figure 1c. Correlation of Prolactin with T4 (r= -0.19)

As shown in Figure 1, among the hypothyroid cases, there is a positive correlation between Prolactin and TSH (r=0.53).The T3(r=-0.27) and T4 (r=-0.19) show a negative correlation with Prolactin.

Correlation of Prolactin with Thyroid Hormones in Hyperthyroid cases

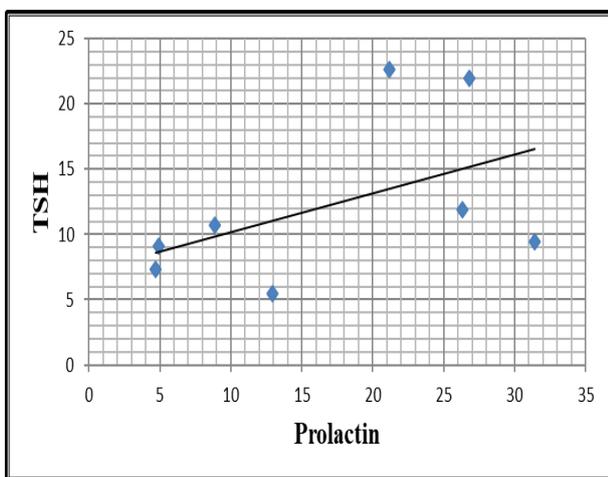


Figure 2a. Correlation of Prolactin with TSH (r=0.3)

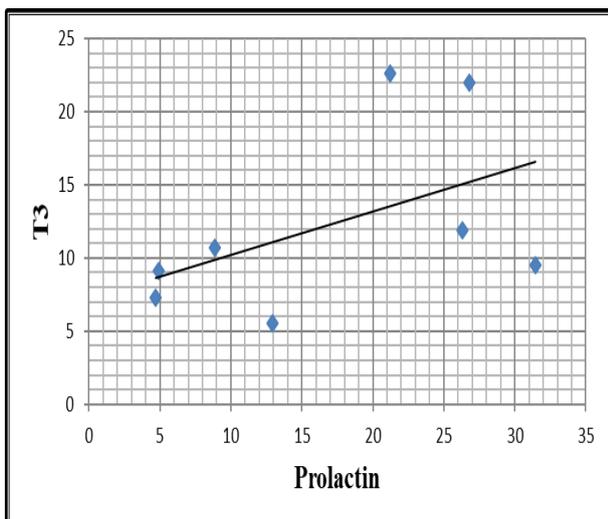


Figure 2b. Correlation of Prolactin with T3 (r=0.38)

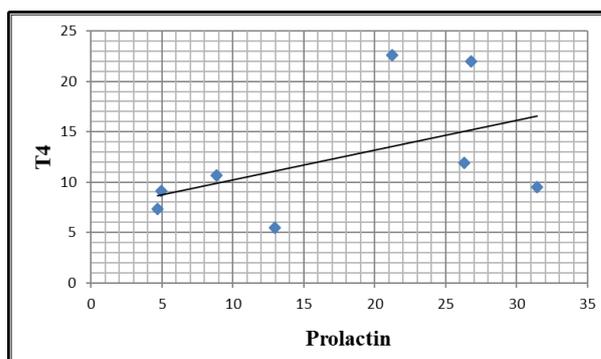


Figure 2c. Correlation of Prolactin with T4 (r= 0.48)

DISCUSSION

Our study has revealed that hypothyroidism is more prevalent than hyperthyroidism. Among the 300 subjects that were evaluated (Table 2), 5.99% (n=18) had thyroid disorders associated with hyperprolactinemia. 34.6% (n=103) had hyperprolactinemia (PRL > 20 ng/ml). In a study in North India by Verma et al the prevalence of hyperprolactinemia was 18.3%, much lesser than our findings. As against this, the prevalence of hyperprolactinemia was higher (41%) in a similar study conducted in Hyderabad (South India) [12].

Out of the total 103 hyperprolactinemics, 85 cases were euthyroid, 14 were hypothyroid and remaining 4 were hyperthyroid. Among the 197 euprolactinemic cases, 178 were euthyroid, 13 were hypothyroid and the remaining 6 were hyperthyroid. Thus it shows that a major proportion of both hyper as well as euprolactinemics were euthyroid.

Our study has thus revealed that hypothyroidism is more commonly related than hyperthyroidism with hyperprolactinemia. The high levels of TRH in hypothyroidism stimulate the release of Prolactin from the pituitary. Of the total hypothyroid cases, 51.8% (n=14) have normal prolactin levels and 48.2% (n=13) are hyperprolactinemic. Of the total hyperthyroid cases, 60% (n=6) have normal prolactin levels and 40% (n=4) have hyperprolactinemia. In studies conducted among infertile women, Choudhary and Goswami [13] observed hyperprolactinemia in 16.6% and Singh *et al* [14] in 57% of infertile women with hypothyroidism. However a study by Sanjari et al [7] has shown that hyperprolactinemia is more frequent in hyperthyroid females and serum prolactin level can be increased in hyperthyroidism.

Correlation study between Prolactin and thyroid hormones in both hypothyroid and hyperthyroid cases reveals that a positive correlation exists between PRL and TSH and T3 and T4 have a negative correlation with PRL in hypothyroid cases and a positive correlation with PRL in hyperthyroid cases. A study performed by Al-Nahi et al [15] among infertile women revealed exactly the same result that we have obtained in our hypothy-

roid cases.

A major proportion of hyperprolactinemia cases are Euthyroid. Hyperprolactinemia is associated with both hypothyroidism as well as hyperthyroidism and is the most prevalent endocrine disorder in the hypothalamic pituitary axis [5]. It is more prevalent in hypothyroid cases. Hyperprolactinemia and hypothyroid disorders are implicated in disorders which include menstrual and ovulatory dysfunctions like amenorrhoea, oligomenorrhoea, anovulation leading to primary infertility, Polycystic Ovary Syndrome (PCOS), galactorrhea, erectile dysfunction and obesity [9,10, 11].

CONCLUSION

Prolactin has a positive correlation with TSH in both hyperthyroidism and hypothyroidism. Both Prolactin and thyroid hormone levels should be estimated in cases of infertility, menstrual disturbances and thyroid disorders.

Limitation of study: However the limitation of our study is that it was a pilot study at a rural scale based on a small sample size of only one centre. Substantial additional work is still required to determine the true correlation of prolactin with thyroid hormones in the various clinical settings.

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Conflicts of Interest: The authors have none to declare.

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