

## A hospital based cross sectional study on serum LDH, Iron, TIBC and Ferritin levels in hyperthyroidism

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**Abstract: Background:** Ferritin is an iron storage protein which is present in most of the tissues. Its levels in the serum are altered in thyroid disorders and also reflects the thyroid function with any change in its level

**Objective:** Thyroperoxidase which is dependent on iron for the synthesis of thyroid hormones. So there is an association with thyroid profile and ferritin levels. The aim of study is to investigate the changes in serum levels of ferritin and LDH in hyperthyroidism

**Materials and Methods:** Ferritin, Iron, TIBC and LDH levels were estimated in 50 age and sex matched patients of hyperthyroidism using Thyroid profile and ferritin levels were estimated using CLIA in Mindray. Iron, TIBC and LDH levels were estimated in ERBA chem7 and the results were correlated statistically.

**Results:** Serum ferritin levels were found to be significantly increased in patients with hyperthyroidism compared to normal subjects ( $p < 0.001$ ) and TIBC levels were significantly reduced.

**Conclusion:** Hyperthyroidism is associated with high serum ferritin levels. The estimation of serum ferritin may help in understanding the etiopathogenesis, diagnosis, and monitoring of hyperthyroid patients.

**KEY WORDS:** Ferritin, hyperthyroidism, LDH – Lactate Dehydrogenase

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### I. Introduction

Thyroid gland synthesizes thyroid hormones which plays a role in cell differentiation, its development and also plays a role in controlling basal metabolic rate. In hyperthyroidism the thyroid hormones are synthesized more which will be presenting with excitability, intolerance to heat, increased perspiration, weight loss, diarrhoea, muscle weakness, anxiety or psychic disorders, extreme fatigue, lack of sleep and tremors of the hands<sup>1</sup>. It is common in the world affecting approximately 2% of women population and 0.2% men.<sup>2</sup> Overt thyrotoxicosis can be defined as a TSH level of less than 0.40 mIU/L (normal, 0.4 – 4.0 mIU/L) with elevation of FT4 concentration (normal, 0.8 – 1.9 ng/dL) and subclinical hyperthyroidism is defined as TSH level of less than 0.40 mIU/L with normal FT4 levels<sup>3</sup> and in clinical hyperthyroidism the TSH levels  $< 0.1$  mIU/ml.<sup>4</sup>

Lactate dehydrogenase is an enzyme which catalyzes the conversion of pyruvate to lactate along with NADH and NAD in glycolysis. It has different isoenzymes with subunit H and M found in different organs like liver, brain, muscle and heart. In some of the studies showed there is an elevation of LDH levels in hyperthyroid patients which may be due to decreased or increased release from liver<sup>5</sup> and also its value are inversely related to T3 and T4.<sup>6</sup>

Ferritin is an iron storage protein found in most of the body tissues. It has been reported that there is an alteration in the thyroid functions. Any change in the level of ferritin will be reflecting thyroid function. Thyroid peroxidase (TPO) is a membrane-bound glycosylated hemoprotein plays a role in organification of thyroid hormone. In Iron deficiency it impairs the synthesis of thyroid hormone. Several groups have documented an association between T3 levels and ferritin expression<sup>7</sup>. In some of the studies showed that hyperthyroid is oxidative stress like condition which results in release of superoxide leading to increase of release of more iron and decrease in transferring levels.<sup>8</sup>

To the best of my knowledge there are no study was done in these hyperthyroid patients and also there are very few studies and few literatures available in the hyperthyroid patients regarding ferritin and LDH. This study helps in preventing development of anaemia and also treating early can avoid complications arising from this in hyperthyroid patients.

### II. Methods and Results:

It is a cross sectional study which is designed on the patients who are attending medical OPD to this hospital and the study is carried in the Biochemistry Department, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, Chinnaoutpalli. We have collected 50 samples of age and sex

matched were collected for estimating Thyroid Profile, Iron, TIBC, LDH and Ferritin levels in both control and the patients. Thyroid and Ferritin were estimated in chemiluminescence Mindray hormonal auto analyzer and LDH is measured in ERBA chem7 semi auto analyzer. The study is approved by our ethical committee. Written consent is taken for this work and they are also given free option to withdraw anytime from this study.

**Inclusion Criteria:** The patient who are willing to give written consent for the project. The patient who are diagnosed recently as hyperthyroid patients within 1 year. The patients of age 18 to 40 years were included in our study.

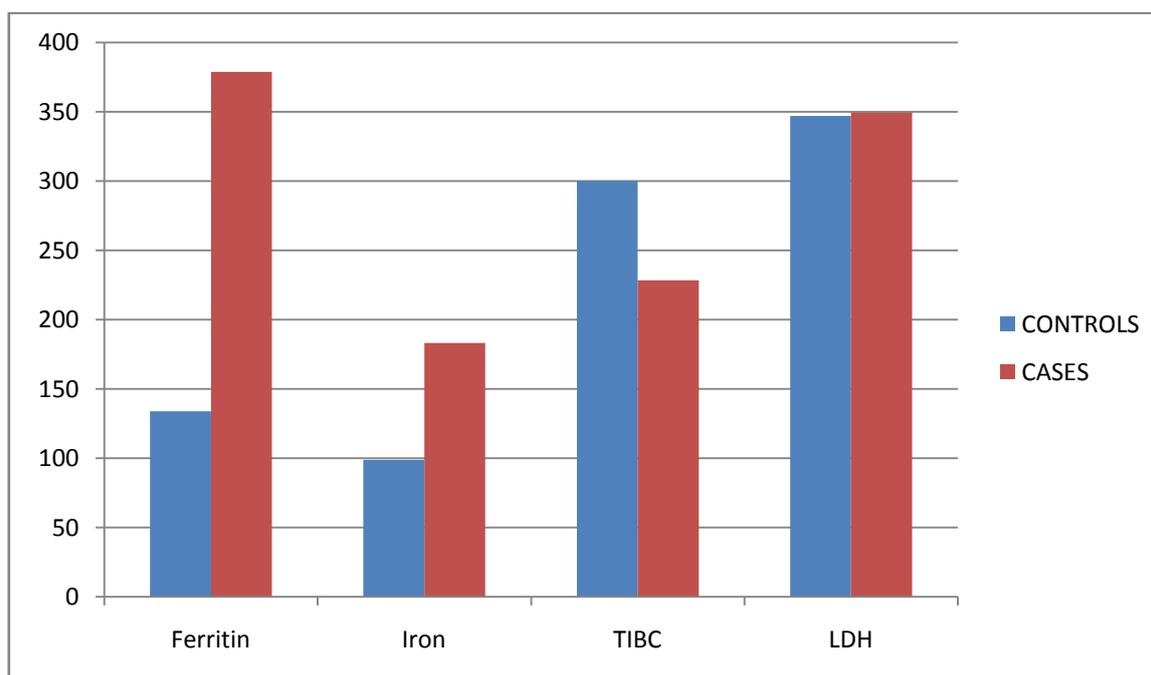
**Exclusion criteria:** the patient who are not willing to give consent for this project. The patient who are ill and admitted in the hospital, the patient who were identified as having liver disease and patient who are diagnosed as hyperthyroid and on treatment for a long period.

The data analyzed statistically by graph pad version 6. The results will be explained in simple way i.e. mean  $\pm$  standard deviation for quantitative variables, p value  $<0.05$  shall be considered as significant.

**Results:**

Parameter	Test Mean $\pm$ SD	SEM	Controls Mean $\pm$ SD	SEM	p Value
T3	3.91 $\pm$ 2.00	0.28	1.10 $\pm$ 0.26	0.03	$< 0.0001^*$
T4	22.47 $\pm$ 5.70	0.8	9.17 $\pm$ 2.38	0.33	$< 0.0001^*$
TSH	0.104 $\pm$ 0.09	0.01	2.189 $\pm$ 1.47	0.2	$< 0.0001^*$
Ferritin	378.76 $\pm$ 28.10	3.97	133.89 $\pm$ 76.78	10.85	$< 0.0001^*$
TIBC	228.36 $\pm$ 19.31	2.73	300.30 $\pm$ 47.87	6.77	$< 0.0001^*$
Iron	183.20 $\pm$ 25.14	2.45	98.78 $\pm$ 22.92	3.24	$< 0.0001^*$
LDH	349.45 $\pm$ 90.32	15.22	347.11 $\pm$ 60.36	8.53	0.879 (NS)

T3 ( $p < 0.0001$ ) and T4 ( $p < 0.0001$ ) are significantly elevated statistically and TSH ( $p < 0.0001$ ) is significantly decreased statistically. Ferritin and iron ( $p < 0.0001$ ) is statistically elevated and TIBC ( $p < 0.0001$ ) is decreased significantly when compared to controls. LDH is not significant.



**Fig 1.** Comparison of Ferritin, Iron, TIBC and LDH between hyperthyroid patients and controls

**III. Discussion:**

The result of the present study shows an increased levels of serum ferritin and iron levels in hyperthyroid patients. It may be due the action of thyroid hormones on its synthesis and storage<sup>9</sup> but the action on the expression of ferritin regulation should be further evaluated. These results are according to the other studies on hyperthyroid patients.<sup>10,11</sup> In some studies it has been shown that the beside iron storage function it can carry 4500 atoms of iron and also shown that any increase in ferritin levels it may lead to elevation of serum iron<sup>12, 13, 14</sup>. An increase ferritin level in hyperthyroidism is due to the action of thyroid hormones and TSH on ferritin synthesis and its release.

There is no significant change in LDH levels both in healthy individuals and the hyperthyroid patients. It has been shown that the thyroid hormones have no significant effect on LDH in both clinical and subclinical hyperthyroidism. Our study differs in some of the studies it has been shown that there is a elevation in LDH levels in hyperthyroidism. It could be a reflection that increases or decreases clearance from the liver.<sup>15</sup> Strasberg reported no association of hyperthyroidism with elevated levels of the LDH isozyme.<sup>16</sup> In our study there is a decrease of TIBC levels and it is correlation with the study<sup>17</sup>. As the thyroid hormones has an effect on the synthesis and release of ferritin.

#### **IV. Conclusion:**

Hyperthyroidism is associated with high serum ferritin levels. The estimation of serum ferritin may help in understanding the etiopathogenesis, diagnosis, and monitoring of hyperthyroid patients. It also seems to be there are few literatures available in connection with ferritin , iron and TIBC levels in hyperthyroidism and lot of research activity to be taken up which may help the patients for better outcome.

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