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Assessment of Iron, Ferritin, TIBC and LDH levels a cross sectional study in Hypothyroid patients

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LDH -Lactate Dehydrogenase

TIBC -Total iron binding capacity

ABSTRACT

Aim: Is to study the changes of serum ferritin, Iron, TIBC and LDH levels which may affect the thyroid functions in hypothyroid patients.**Materials and Methods:** Serum Thyroid profile, Ferritin levels were estimated in 50 age and sex matched controls and patients of hypothyroidism, using CLIA in Mindray. Serum 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 decreased in patients with hypothyroidism compared to normal subjects ($p < 0.001$) and TIBC levels were significantly increased.**Conclusion:** Hypothyroidism is associated with low serum ferritin levels. The estimation of serum ferritin may help in understanding the etiopathogenesis, diagnosis, and monitoring of hypothyroid patients.© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

1. Introduction

Thyroid gland is an endocrine gland which is in butterfly shape located lower part of the neck. They contain follicular cells which is responsible for synthesis of thyroid hormones T3 and T4 besides the follicular cells they also contain parafollicular cells which synthesizes calcitonin.¹ It mainly plays a role in controlling basal metabolic rate, cell differentiation and development and also plays a role in maintaining calcium levels.

Ferritin is a protein which plays an important role that it indicates the storage levels of iron and had positive correlation between ferritin and iron stores.^{2,3} Iron acts as a co factor for enzymes like TPO.⁴ It acts by oxidation of iodine which later binds to tyrosyl of thyroglobulin.⁵ When there is a decrease in iron status it leads to derailment of this enzyme causes effect on thyroid hormone synthesis.⁶ Some of the studies showed there will be a decrease in iron storage level status in hypothyroidism.⁷

Hypothyroidism is an endocrine disorder which ranges from an overt state of myxedema, end-organ effects and multisystem failure to an asymptomatic or sub clinical condition state.⁸⁻¹¹ The prevalence of hypothyroidism in the developed world is about 4-5%.^{12,13} The prevalence of sub clinical hypothyroidism in the developed world is about 4-15%.¹⁴ It is a most common disorder of thyroid gland which effects irrespective of age, sex and socioeconomic status. Overt hypothyroidism presents with low levels of serum thyroid hormone levels and TSH levels are elevated. Subclinical hypothyroidism presents with normal serum thyroid hormone levels are within normal levels and there is a elevation of TSH levels.¹⁵ To diagnose subclinical hypothyroidism it is solely based on biochemical diagnosis.

The aim of this study is to see and make them to get corrected iron profile status in hypothyroidism at the earliest in our Gannavaram Mandal, Krishna District, Andhra Pradesh.

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Table 1: Showing the mean & SD of the following parameters

Parameter	Cases Mean \pm SD	SEM	Controls Mean \pm SD	SEM	p value
T3	1.03 \pm 0.10	0.015	0.45 \pm 0.14	0.024	< 0.001*
T4	8.79 \pm 1.29	0.183	3.47 \pm 0.58	0.082	< 0.001*
TSH	2.86 \pm 0.92	0.131	21.42 \pm 6.08	0.860	< 0.001*
IRON	99.86 \pm 26.46	5.46	50.12 \pm 5.20	10.95	< 0.001*
FERRITIN	107.98 \pm 41.82	3.74	25.14 \pm 6.12	0.74	< 0.001*
TIBC	305.14 \pm 35.49	8.34	471.42 \pm 38.95	0.87	< 0.001*
LDH	293.80 \pm 38.59	5.02	523.14 \pm 77.41	5.51	< 0.001*

T3 ($p < 0.001$) and T4 ($p < 0.001$) are significantly decreased statistically and TSH ($p < 0.0001$) is significantly elevated statistically. Ferritin and iron ($p < 0.001$) is statistically decreased and TIBC ($p < 0.001$) is significantly elevated when compared to controls. LDH ($p < 0.001$) is significantly elevated statistically.

2. Materials and Methods

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. Fifty (50) samples of age and sex matched were collected for estimating Thyroid Profile, Iron, TIBC, LDH and Ferritin levels in both control and the hypothyroid patients. We collected 3ml of venous blood for estimating these parameters. Thyroid profile and Ferritin were estimated in chemiluminescence Mindray hormonal auto analyzer and LDH is measured in ERBA chem 7 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.

2.1. Inclusion criteria

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

2.2. 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 hypothyroid 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 considered as significant.

3. Result and Discussion

In our study we found that there is a significant low level of iron, ferritin and increased TIBC levels in our subjects with altered thyroid profile indicated by decreased in blood levels of T3 ($p < 0.001$) and T4 ($p < 0.001$). By this we can say there is positive correlation between iron deficiency and thyroid

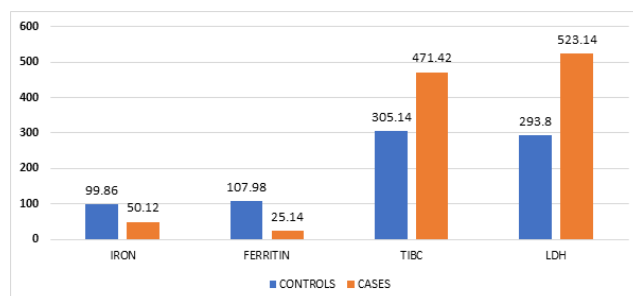


Fig. 1: Comparison of serum Ferritin, Iron, TIBC and LDH between hypothyroid patients and controls

status. Our study is in accordance with other studies.¹⁶ Akhter S et al., reported that there is a significant alteration in thyroid hormone status in iron deficient people where it effects the enzyme TPO activity leading to the alteration in thyroid function.⁵ Another similar study which states that in iron deficiency anemia the TPO activity is decreased with decreased transportation of thyroid hormones into the cell which leads to development of hypothyroid condition.¹⁷ Eftekhari MS et al., showed that there is inverse relationship with plasma ferritin levels with thyroid hormones and iron status.¹⁸

Thyroid hormones play a role in regulation of gene expression for transferrin. The expression of gene for ferritin can be induced by T3 hormone.¹⁹ These hormones play a role in erythropoiesis and helps in erythroid colony development. Thus, hypothyroidism may lead to bone marrow repression and/or decrease in production of erythropoietin due to decreased oxygen requirement.¹⁹ In our study we found that there is increase in serum LDH activity with hypothyroid patients. In primary hypothyroidism LDH activity reported as increased.^{20,21} Thyroid dysfunction may alter the function of Liver, muscle and kidney function which plays a role in metabolizing thyroid hormones.²² Elevation of LDH reflects increase or decrease clearance from the liver.²³ These changes may result from reduction in muscle mitochondrial oxidative capacity and β -adrenergic receptors, as well as the induction of an insulin resistant state.²⁴ In our study LDH activity is

correlating with hypothyroidism.

Our study has tried to establish a relationship between total body iron status in patients of altered thyroid profile in hypothyroidism, which will help the medical professional to have an account of iron profile assessment in patients of thyroid disorders.

4. Conclusion

In the conclusion we want to establish how the thyroid is affected with alteration in iron profile status along with LDH levels. By this study we can help the patients to get better treatment and make them more comfortable. Further studies are required by taking larger sample size for better establishing the relationship and eliminating the possible confounders.

5. Source of Funding

None

6. Conflict of Interest

The authors declare no conflict of interest.

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