



Research Article

Section: Biochemistry

A Study of Serum Iron and Ferritin Levels in Hypothyroid Patients- A Hospital Based Study

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ABSTRACT

Introduction: Iron deficiency is one of the most common and preventable nutritional problem in India. Thyroperoxidase, an Iron containing enzyme is essential for initial 2 steps of thyroid hormone synthesis. So thyroid hormone may be altered in Iron deficiency. Ferritin is an iron storage protein found in almost all body tissues. Serum ferritin levels also have been reported to be altered in patients with thyroid disease. Metabolism of thyroid hormones and iron is quite inter- dependent. Deficiency of iron can produce hypothyroidism and vice versa. **Materials & Method:** This observational study was conducted in the department of Biochemistry at Tezpur Medical College and Hospital from January to July 2024. 30 diagnosed hypothyroid patients were investigated for the levels of serum Iron and ferritin and compared with age and sex related healthy control group. **Results:** The results were analyzed using appropriate statistical test. The data compiled were analyzed with GraphPad Instat@ 3 Statistical Software. **Conclusions:** In our study we found that the levels of iron and ferritin were reduced in hypothyroid patients as compared to control groups. Hence, thyroid hormone insufficiency may lead to deficiency of serum iron and ferritin.

INTRODUCTION

Thyroid hormones plays a vital role in the proper development of our body and are thought to be one of the most important hormonal variables in controlling the fundamental metabolic rate of functioning organs such as the liver, heart, kidneys and brain [1]. Hypothyroidism is common, affecting 1% of general population and about 5 % of individuals over age 60 years [4]. Thyroid hormones are thought to affect hematopoiesis by causing non-erythroid cells to produce more erythropoietin or hematopoietic factors. Triiodothyronine (T3) acts through intracellular T3- receptor proteins, which primarily control transcription by binding to particular T3-response regions in functional genes. Iron metabolism is very intricately connected to thyroid hormone metabolism.

Normal thyroid status is dependent on the presence of many trace elements e.g. Iron, Iodine, selenium, Zinc for both synthesis and metabolism of thyroid hormones [2]. Iron is a component of many enzymes including thyroid hormone biosynthesis. Low ferritin levels are also observed in hypothyroid patients [3]. Several studies in animals and humans have shown that nutritional iron deficiency

may significantly lower the circulating levels of both thyroxine and triiodothyronine and may also reduce conversion of T4 to T3 [5,6]. Additionally it has been observed that iron shortage increases in vitro hepatic rT3 deiodination and decreases plasma concentration of T3 and T4, indicating that iron deficiency deactivates a mechanism involved in thyroid hormone metabolism. The mechanism by which iron shortage affects deiodinase activity is still unknown [6]. Hypothyroidism, itself may lead to low iron levels due to poor gut absorption as a result of decreased levels of digestive acids/ enzymes or due associated autoimmune conditions like celiac disease [7]. Another possibility is that it results from heavy menstruation, which some female patients have. Thus there is substantial correlation between hypothyroidism and iron deficient disorders. Patients with hypothyroidism may benefit from estimation of their iron profile since the underlying cause of their condition may be iron deficiency. Serum ferritin is an iron storage protein found in almost all the body tissues. Thus, changes in serum ferritin reflects thyroid gland functioning [8]. If a patient is iron

deficient, thyroxine medication may exacerbates sympathetic symptoms like anxiety, palpitations, irregular heartbeats etc [9].

There aren't many reports in the literature on the iron profile of hypothyroid patients. Being a third world country, iron deficiency is very common in general population, and the prevalence of hypothyroidism has increased drastically in recent years. Therefore, this study is done to estimate serum Iron and Ferritin levels in diagnosed hypothyroid patients.

Aims and objectives

1. To determine the status of Serum Iron and ferritin levels in Hypothyroid patients in Tezpur Medical College and Hospital, Assam.
2. To compare the status of serum Iron and ferritin levels with age and sex matched healthy individuals.

MATERIALS AND METHOD

This study was conducted in the Department of Biochemistry, Tezpur Medical College and Hospital, Bihaguri, Assam.

A total of 30 diagnosed hypothyroid patients (age group 19-59 years) who attended the hospital from February to July 2024 were selected which were compared with apparently healthy individuals of age and sex matched control group. The diagnosis was based on detailed clinical history and thyroid profile analysis. All the patients and controls were subjected to routine biochemical investigation. 5ml of venous blood sample were collected in vaccutainer under proper aseptic conditions after obtaining informed consent and taking care of ethical issues. Serum was separated by centrifugation and Serum Iron and ferritin were estimated. Total T3 (TT3), Total T4 (TT4), fT3 (free T3) and fT4 (free T4) were analyzed using radioimmunoassay, Thyroid

stimulating hormones (TSH) and ferritin levels by using chemiluminescence immunoassay. While Serum Iron were estimated by autoanalyzer (vitros 5600) using kits by Quidel Ortho, orthoclinical diagnostic, United states (10). The results were compared with age and sex matched control groups by applying appropriate statistical analyses and correlations were calculated by applying Pearson's formula.

Inclusion Criteria:

1. Patients in the age group of 19-59 years
2. 30 diagnosed cases with detailed history of hypothyroidism
3. Diagnosed patients who underwent thyroid profile.
4. 30 healthy individuals age and sex matched.

Exclusion Criteria:

1. Patients suffering from infectious diseases, Hepatic diseases, Bone diseases, Diabetes mellitus, Alcoholism, Anemia, Pregnant and Lactating females
2. Patients receiving any mineral supplementation containing iron supplements
3. Patients not willing to participate in the study
4. Use of chronic diuretics.

RESULTS

There were 21 females and 9 males in cases and 20 females and 10 males in control group. The Mean +_ SD age of cases were 30 +_ 15.54 years while it was 32 +_ 15.24 years in control group with the range of 19-59 years respectively. There is was no significant age difference with respect to age distributions in cases and controls (p<0.005).

The levels of total T3 and T4, TSH, ferritin and serum Iron have been shown in in table below. The graphical representation with TSH were given below.

Table1: Comparison of Thyroid Profile and Iron Profile in Hypothyroid Patients and Healthy Control Group

	Healthy Control	Hypothyroid Patients	P Value
TT3(ng/dl)	124.32 +_ 33	65.66 +_ 28.72	<0.001
TT4(ug/dl)	7.34 +_ 2.36	3.66 +_ 1.66	<0.001
TSH(ulU/ml)	1.66 +_ 0.86	12.88 +_ 6.23	<0.001
FT3(ng/dl)	3.22 +_ 0.66	2.01 +_ 0.08	<0.001
FT4(ng/dl)	1.22 +_ 0.06	0.60 +_ 0.02	<0.001
Sr. Iron(ug/dl)	76 .32+_ 16.4	42.12 +_ 6.22	<0.001
Sr. Ferritin(ug/L)	30.55 +_ 18.65	12.33 +_ 8.23	<0.001

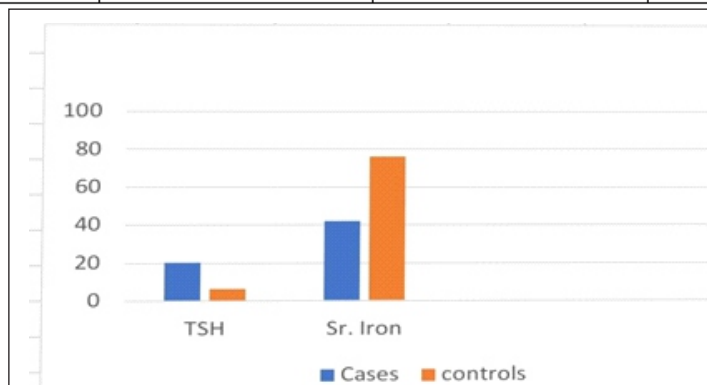


Figure 1: Comparison of Serum TSH and Serum Iron in Hypothyroid Patients and Healthy Control Group

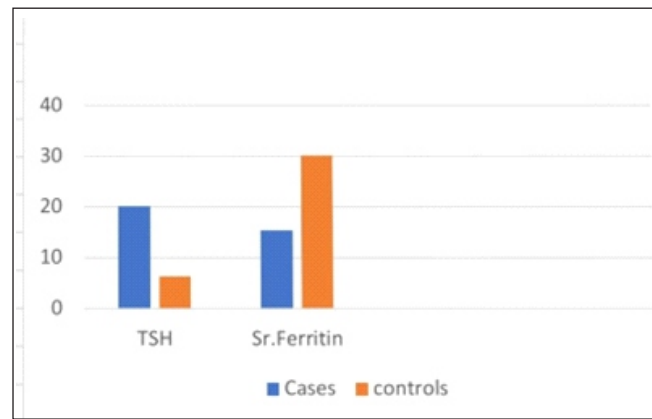


Figure 2: Comparison of Serum TSH and Serum Ferritin in Hypothyroid Patients and Healthy Control Group

In the present study it was found that both Serum Iron and Ferritin concentrations are found to be significantly low in patients with hypothyroidism as compared to healthy controls.

DISCUSSION

Iron is one of the most important nutrients for thyroid function. It is essential for the synthesis and metabolism of thyroid hormones. The thyroid hormone T4 requires iron to be produced, and T4 is then transformed into T3 [10]. Hess SY et al. state that there is a notable decrease in TPO activity in iron shortage, and this decrease in TPO activity [11].

Anemia is a severe public health issue in India, which can be exacerbated by hypothyroidism. Thyroid diseases are one of the most common endocrine disorders worldwide, including in India. In recent population based study in India, the prevalence of hypothyroidism among adults was 3.9 % [12]. Levothyroxine treatment in Iron deficiency anemia improves blood count, white blood cell differentials, reticulocyte count and iron status.

In this study the mean blood ferritin level and iron were significantly lower in hypothyroid patients when compared to control groups. In hypothyroid patients, serum ferritin showed a positive and substantial connection with both T3 and T4. In patients with hypothyroidism, ferritin and thyroid stimulating hormone (TSH) were found to be negatively and highly significantly correlated. Serum iron and the following thyroid function measures showed a similar pattern of connection in the hypothyroid patient group.

Low thyroid hormone levels have been linked to iron insufficiency, according to certain research. Transferrin gene expression is regulated in part by thyroid hormones. The hormone T3 has the ability to promote the expression of the ferritin gene. These hormones aid in the establishment of erythroid colonies and are involved in erythropoiesis. Because hypothyroidism reduces the need for oxygen, it can therefore result in bone marrow repression and/or a decrease in erythropoietin.

LIMITATIONS

The sample size was small, and there was no racial or geographical diversity in the study population. Therefore, the results may not be representative of the population at

large. The data were obtained from a single centre without randomization and further follow-up of patients.

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