

Original research article**Correlation of S. Ferritin Levels in Hypothyroid Patients at Tertiary Care Hospital****Dr. Nisha Jha¹, Dr. Rekha Kumari², Dr. Neha Bharti³, Mithilesh Kumar Jha⁴, Dr. Praveen Kumar⁵**¹Senior Resident, Department of Biochemistry, IGIMS Patna²Prof. & Head, Department of Biochemistry, IGIMS Patna³Senior Resident, Department of Biochemistry, IGIMS Patna⁴Senior Resident, Department of Microbiology, AIIMS, Patna⁵Additional Prof. Department of general Medicine, IGIMS, Patna**Corresponding Author: Dr. Neha Bharti****Abstract**

Background: Thyroid gland is an endocrine gland that secretes thyroxine (s.T3), tri-iodothyronine (s.T4) under the effect of TSH (thyroid stimulating hormone). Synthesis and secretion of hormones are dependent on negative feedback mechanism.

Objectives. The objective of our study was to determine and assess the correlation between serum ferritin and thyroid hormone levels among hypothyroid and euthyroid subjects.

Materials and methods: A cross-sectional study was conducted on 100 patients with a history of hypothyroidism diagnosed based on their TSH levels, age group between 20-60 years. Samples collected from patients visiting Medicine OPD, IGIMS, Patna, with clinical symptoms of hypothyroidism tested for s. ferritin, s.fT3, s.fT4 and s.TSH were considered for the study.

Conclusion: In our study we found that there is a significant increase in level of s.ferritin in hypothyroidism patients, on taking history it was found that majority of patients were diagnosed cases of Type-2 Diabetes Mellitus.

Keywords: TSH, Diabetes mellitus, S. Ferritin, Hypothyroidism.

Introduction

According to year 2014 at a national workshop on advanced management of thyroid disorders held in Chennai, India it was found that 42 million people in India suffer from thyroid disorders. Among all the thyroid disorders in India, hypothyroidism is one of the most commonest disorders. Despite of such a crucial situation India does not have a potential or scientifically proven efficient policy to control the disease. As per the Chairperson of Medanta Division of Endocrinology and Diabetes (Gurgaon, India), the reason for increased levels of TSH in India, is linked to long standing iodine deficiency in India that is not completely corrected over last 20 years. The prevalence as per the age is higher in age group 46-54 years that is, 13.1% and about 7.5% in people aged 18-35 years (1). Thyroid gland is an endocrine gland that secretes thyroxine (s.T3), tri-iodothyronine (s.T4) under the effect of TSH (thyroid stimulating hormone). Synthesis and secretion of hormones are dependent on negative feedback

mechanism. During circulation of blood s.T3 and s.T4 are present in bound form to carrier protein and constitute about 99.97% and 99.7% of s.T3 and s.T4 respectively. Therefore, only small fraction of biologically active compounds are present in free form such as fT3 and fT4 are present in circulation that is 0.03 % and 0.3% respectively (2) Hypothyroidism is defined as decrease in s.T3 and s.T4 levels and increase in serum thyroid stimulating hormone (s.TSH) levels as compared to normal levels. When there is abnormality primarily from thyroid gland itself rather than other organs is known as primary hypothyroidism. Secondary hypothyroidism is a condition in which there is pituitary gland malfunctions, decreasing TSH production and, by extension, s.T3 and s.T4 levels. When s.TSH is above 10mIU/L and decrease s.T4 and s.T3 is known as overt hypothyroidism and in sub-clinical hypothyroidism increase TSH 4-10 mIU/L with normal s.T3 and s.T4 (3). Our study was based on diagnosis of patients of hypothyroidism based on their s.fT3, s.fT4 and s.TSH levels and their correlations with s.Ferritin levels in human body. Thyroid diseases are different from other diseases in terms of their ease of diagnosis, accessibility of medical treatment, and the relative visibility that even a small swelling of the thyroid offers to the treating physician. Early diagnosis and treatment remain the cornerstone of management.(4). For normal metabolism of thyroid gland elements like iodine, iron, selenium and zinc are essential in required proportion (5). Iron is essential for normal functioning of thyroid gland and it is stored in the body in form of ferritin and is an intracellular protein. All cells in the body contain ferritin in stored form that act as a reserve of iron and small amount secreted in serum for formation of Hb and other heme proteins (6). The first two steps of synthesis of thyroid hormone require an iron containing enzyme known as thyroperoxidase (TPO) which is a membrane bound glycosylated hemo-protein [7]. During iron deficiency, tissue iron start diminishing at the earliest leading to alteration in activity of heme dependent enzyme TPO and impaired biosynthesis of thyroid hormones (5). Patients suffering from thyroid disease have altered serum ferritin levels in their blood. This shows that there is changes in serum ferritin levels in case of thyroid diseases (8). Diseases Associated With Higher Ferritin levels are Inflammatory conditions, Chronic kidney disease, Rheumatoid arthritis, Autoimmune disorders, Acute infections, Cancer, Hepatitis C infection(9), Anemia of Chronic Disease (10), Type 2 diabetes(11), Metabolic syndrome(12), Atherosclerosis, Fatty liver disease patients(13), Anorexia(14), Graves' disease, Still's disease(15), Arrhythmias (16), Chronic, Hemochromatosis(17), Hemophagocytic syndrome, Sideroblastic anemia (18). On completion of study and interpretation of data it was found that s.ferritin levels were increased in case of hypothyroidism. On taking patient's history it was found that most of the patients had a history of diagnosed type 2 diabetes. Further studies need to be done on patients of hypothyroidism with type 2 diabetes and correlate it with their s.ferritin levels to prove the concept.

Objectives.

The objective of our study were to determine and assess the correlation between serum ferritin and thyroid hormone levels among hypothyroid and euthyroid subjects.

Materials and methods

A cross sectional study was conducted on 100 patients with a history of hypothyroidism diagnosed based on their TSH levels, age group between 20-60 years. Samples collected from patients visiting Medicine OPD with clinical symptoms of hypothyroidism tested for s. ferritin, s.fT3, s.fT4 and s.TSH were considered for the study.

Patients with s.TSH level ≥ 5.00 μ IU/ml were considered as patients suffering from hypothyroidism and their fT3 and fT4, s.ferritin levels were noted down simultaneously. Study was conducted for a period of 1 year, from April 2021 to April 2022 . All the tests s.ferritin,

s.fT3 and s.fT4 and s.TSH were performed on fully automated analyser Architect Abott i2000 SR which works on the principle of CMIA (Chemiluminiscence Magnetic Immunosorbent Assay).

Procedure: Blood samples were collected from the study participants who visited the laboratory for s.ferritin, fT3, fT4, and TSH. From the above selected subjects, under aseptic precautions, 3ml of venous blood sample was drawn into a plain tube vacutainer. These tubes were allowed to stand for specific period of about 15-20 minutes. Then tubes were centrifuged for 3500 rpm for 15- 20 min. Serum samples were separated and tested for the below listed biochemical parameters by various enzymatic method as mentioned in the fully Automated Abbott Architect i2000 SR analyzer. Daily quality check for control materials were assayed before processing samples in the the fully Automated Abbott Architect i2000 SR analyzer and the participants were informed about their results along with appropriate advice.

Statistical Analysis: The collected data was entered in Microsoft excel and the data analyzed by using Epidata software. Descriptive statistics like mean, percentage, standard deviation and Inferential statistics such as chi square test, Independent t test were used. p value < 0.05 will be considered as statistically significant.

Results:

Table 1:

S. no.	n=100	Mean \pm SD	r-value	p-value
1.	S.ferritin	421.1819 \pm 436.387	-0.3258	<0.0001
	S.fT3	2.33 \pm 0.538		
2.	S.ferritin	421.1819 \pm 436.387	-0.0557	<0.0001
	S.fT4	0.8704 \pm 0.5381		
3.	S.ferritin	421.1819 \pm 436.387	0.4334	<0.0001
	S.TSH	12.75 \pm 16.338		

As seen in Table 1, Mean values of s.ferritin were higher among hypothyroid subjects on comparing it with s,TSH, s.fT3 and s.fT4 in hypothyroid subjects with a p value of <0.0001. Total number of 62 females and 38 males were included in the study. For Age, Mean \pm SD was 43.34 \pm 14.69.

Discussion

Our study shows that there is a increase level of serum ferritin in patients with hypothyroidism. Few studies conducted on animals as well as humans proved that iron deficiency is associated with impaired thyroid gland functions. Some studies have suggested that T3 levels to normal limit after iron treatment but recovery of iron deficiency anemia by blood transfusion did not change T3 and T4 levels (19,20,21). It is observed that TSH levels was elevated in cases as compared to controls, suggesting that depletion of iron stores may decrease serum fT4 and fT3 levels. Globally, Prevalence of endocrine disease is increasing among females significantly. Thyroid disease is one of the most commonest cause of endocrine disorders. In this study we concluded that levels of serum ferritin was increase in cases of hypothyroidism (22). Our study was more similar to the study conducted by Jali M V et al, On assessment between serum ferritin and thyroid hormone profile in hypothyroidism, they concluded in their study that s.ferritin levels were significantly raised in patients with hypothyroidism with Diabetes mellitus (23). Kiran et al, conducted a study on Thyroid profile and metabolism of iron. They concluded that levels of iron and ferritin were significantly decreased while level of TIBC (total iron binding capacity) were significantly increased in hypothyroidism as compared to healthy

individuals (24). Role of thyroid hormone is maintaining body homeostasis, which plays a major role in the process of biosynthesis of thyroid hormone, where Thyro peroxidase (TPO) has a key role as an iron dependent key enzyme. (25). Another study conducted by Dr Sahana et al, found that mean value of serum ferritin concentration in euthyroid subjects was higher (71.13 ± 67.67 ng/ml) as compared to the mean value of serum ferritin among hypothyroid subjects (36.09 ± 28.0 ng/ml) and it was found to be statistically significant. [26]. As per study conducted by Hantrakool S et al in the year 2012, the study found elevated serum ferritin level is a predictor of the development of Diabetes Mellitus and hypothyroidism in thalassemia patients with iron over load. Maximum s.ferritin levels of greater than 2500 and 3500 μ g/dl are associated with diabetes mellitus. (27). koperdanova M conducted a study that mentioned, elevated ferritin levels are usually due to causes such as acute or chronic inflammation, chronic alcohol consumption, liver disease, renal failure, metabolic syndrome or malignancy rather than iron overload (28). Circulating ferritin levels showed sex-specific prognostic patterns. High ferritin levels in men with no major chronic disease and low ferritin levels in all women were associated with increased all-cause mortality after adjusting for covariates. High ferritin levels in men with no major chronic diseases were also independently associated with an increased risk of cardiovascular mortality. Future research is needed to clarify the prognostic role of ferritin.(29) In a study conducted by Ford ES on 9.5 k US adults , those with higher ferritin levels were more likely to have diabetes and another study was conducted on 524 adults with type 2 diabetics, high ferritin was associated with higher fasting blood glucose, hemoglobin A1c (HbA1C), and CRP [30]. Some scientists are of the opinion that high ferritin is a strong risk factor for the progression of hardening of the arteries (atherosclerosis) [31]. In a study of 196 apparently healthy men and women, higher ferritin was linked with artery stiffness among women [31]. Knovich MA in his study proves that Ferritin was also associated with clogged arteries in 506 people with fatty liver disease [32].

Research Gap: Sample size can be increased for better interpretation and assessment of results. History of patients is must for Diabetes type 2 or other associated diseases with hypothyroidism with increased s.ferritin levels.

Conclusion

In our study we found that there is a significant increase in level of s.ferritin in hypothyroidism patients, on taking history it was found that majority of patients were diagnosed cases of Type-2 Diabetes Mellitus. Hence measurement of serum ferritin before and after thyroid hormone therapy may provide useful information with regard to diagnosis and prognosis of thyroid disease.

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Correlation of Serum Ferritin and Thyroid Hormone Status among Hypothyroidism Dr. Sahana KR1 and Dr. Kruthi BN2,* 1Assistant Professor, Bowring & Lady Curzon Medical College Research Centre, Bangalore, Karnataka-560001, India. 2Assistant Professor, Adichunchanagiri Institute of Medical Sciences, B G Nagar, Mandya, Karnataka – 571418, India.
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