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Original Research Article

A comparative study on iron profile and lipid profile in hypothyroidism and hyperthyroidism in and around Gannavaram

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ABSTRACT

Aim: To see the variations in Iron and lipid profile which may affect the thyroid functions in hypothyroid and hyperthyroidism patients.
Materials and Methods: Ferritin, Iron, TIBC and lipid profile levels were estimated in 50 age and sex matched patients of hyperthyroidism and hypothyroidism using Thyroid profile and ferritin levels were estimated using CLIA in Mindray. Iron, TIBC and Lipid profile levels were estimated in BS380 and the results were correlated statistically.
Results: Serum ferritin levels were found to be significantly decreased in patients with hypothyroidism and increased in hyperthyroidism ($p < 0.001$) and Cholesterol and triglycerides were significantly increased in hypothyroidism when compared to hyperthyroidism.
Conclusion: Both hypothyroidism and hyperthyroidism show the variations in iron and lipid profile. The estimation of iron profile and lipid profile may help in understanding the etiopathogenesis, diagnosis, and monitoring of hypothyroid and hyperthyroidism patients.

1. Introduction

Thyroid gland is an endocrine gland which is a butterfly shaped, locating at lower part of the neck. It synthesizes of thyroid hormones in the follicular cells of thyroid gland.[1] It plays a role in maintaining basal metabolic rate, cell differentiation and development and also plays a role in maintaining calcium levels. It also plays a role in gene expression. The disorders of thyroid gland is not associated with age and gender.[2]

The abnormality in thyroid gland is categorised into hypothyroidism and hyperthyroidism depending on serum T3, T4 and TSH. It may be caused by congenital factors, genetic predisposition, inadequate levels of dietary iodine intake, pregnancy, radiotherapy, viral infection, surgery, underlying disease such as infiltrative disorders, or autoimmunity.[3] Hypothyroidism is an endocrine disorder which ranges from an overt state of myxedema, end-organ effects and multisystem failure to an asymptomatic or subclinical condition state.[4] In the develop world around 4-5% are suffering from hypothyroidism[5] which effects irrespective of age, sex and socio economic status. It will be presenting as elevation of TSH and decrease levels of thyroid hormones whereas subclinical hypothyroidism have normal serum thyroid hormone levels and elevation of TSH levels.[6] In hyperthyroidism they 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 due to excess synthesis of thyroid hormones.[7] It is common in the world affecting approximately 2% of women population and 0.2% men.[8] 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[9] and in clinical hyperthyroidism the TSH levels < 0.1 mIU/ml.[10]

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Thyroid gland will influence the composition and transportation of lipoproteins and also plays role in regulating lipoprotein lipase.[11] Hypothyroidism will be leading to development of hypercholesterolemia caused due to elevation of low density lipoproteins. It is also observed that there is an elevation of very low density lipoproteins (VLDL) and high density lipoproteins (HDL Cholesterol). Increased esterification of fatty acids at the level of liver will be leading to increased plasma triglycerides.[12]

Ferritin is a globular protein which indicates the positive correlation between ferritin and iron stores. Iron will be acting as a co factor for enzymes like peroxidases which acts by oxidation of iodine and binds to tyrosyl of thyroglobulin. It effects the thyroid hormone synthesis if there is any change in iron profile.[13] Few studies showed that there will be a reduction in iron storage levels in hypothyroidism and elevated in hyperthyroidism.

The aim of this study is to respond in both the situations at the earliest and prevent the severity of the disease in and around of Gannavaram Mandal, Krishna District, Andhra Pradesh.

2. Materials and Methods

It is a comparative study which is designed on the patients who are attending medical OPD and the study is carried in the Biochemistry Department, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, Chinnaoutpalli. Age and sex matched 50 samples were collected for estimating Thyroid Profile, Iron profile and lipid profile in both hypothyroid and hyperthyroid patients. Thyroid and Ferritin were estimated in chemiluminesence Mindray hormonal auto analyzer. Lipid profile in BS 380. My study was approved by college ethical committee. We have taken written consent for this study, and they can 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 and hypothyroid patients within 1 year. Age group of 18 to 40 years were included in our study.

2.1. Exclusion criteria

The persons who are not willing to give consent for this study. The patient who are severe ill and admitted in the hospital, the patient who are having liver disease and patient who are hyperthyroid and hypothyroid and on treatment for a long period. The data is analysed statistically by graph pad version 6. The results will be explained in simple way i.e. mean ± standard deviation for quantitative variables, p value.

3. Results and Discussion

T3 ($p< 0.001$) and T4 ($p< 0.001$) are significantly reduced statistically and TSH ($p< 0.001$) is significantly increased statistically. Ferritin and iron ($p< 0.001$) is statistically reduced and TIBC ($p< 0.001$) is increased significantly in hypothyroidism when compared to hyperthyroidism patients.

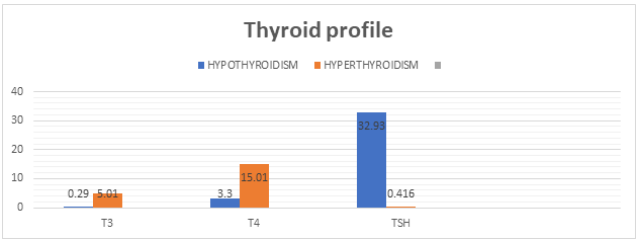

Fig. 1: Comparison of T3, T4 and TSH between hypothyroid and hyperthyroid cases

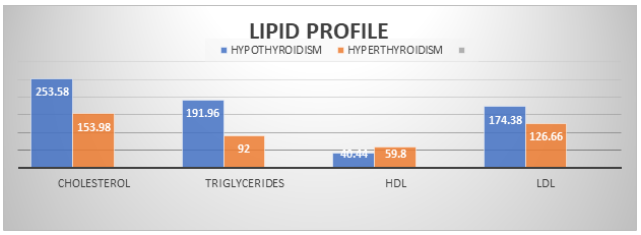

Fig. 2: Comparison of lipid profile between hypothyroid and hyperthyroid cases

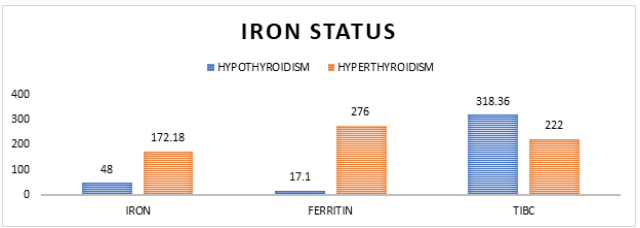

Fig. 3: Comparison of iron, ferritin and TIBC between hypothyroid and hyperthyroid cases

In our study we found iron, ferritin was significantly reduced with the elevation of TIBC in subjects of hypothyroid patients and also showed a positive correlation between iron deficiency and thyroid profile. Our study is in accordance with the studies. Akhter S et al., showed that any alteration in thyroid hormones will be leading to change in iron profile status by affecting the enzyme TPO activity.[14] Hypothyroid may be developed due to disorder in transportation of thyroid hormones into the cell in iron deficiency anemia.[15,16] Some studies showed that there is inverse relationship with plasma ferritin levels with thyroid hormones and iron status. The result of the present study shows an increased levels of serum ferritin and iron levels in hyperthyroid patients. As the thyroid hormones may play a role on its synthesis and storage. This may be due to its

Table 1:

	Hypothyroidism		Hyperthyroidism		p Value
Parameters	**mean±SD**	**SEM**	**mean±SD**	**SEM**	
T3	0.298±0.12	0.017	5.01±2.60	0.36	<0.001
T4	3.302±0.91	0.129	15.01±3.77	0.534	<0.001
TSH	32.93±26.22	3.709	0.416±0.12	0.018	<0.001
Cholesterol	253.58±59.44	8.41	153.98±15.96	2.26	<0.001
TGL	191.96±19.59	2.77	92±27.49	3.89	<0.001
HDL	40.44±7.05	1	59.80±4.95	0.7	<0.001
LDL	174.38±24.20	3.42	126.66±15.33	2.17	<0.001
Iron	48.00±11.34	1.6	172.18±14.23	2.01	<0.001
Ferritin	17.10±2.94	0.41	276.00±17.26	2.441	<0.001
TIBC	318.36±53.25	7.53	222±23.46	3.32	<0.001

action on expression of ferritin regulation which must be evaluated. These results are according to the other studies on hyperthyroid patients.[10,12] Beside the storage function it can also carry 4500 atoms of iron leading to the elevation of ferritin and serum iron.[13] An increase ferritin level in hyperthyroidism is due to the action of thyroid hormones and TSH on ferritin synthesis and its release.

In our study we found that there is increase of total cholesterol and LDL cholesterol in patients who are suffering from hypothyroidism and our study is correlating with the previous conducted some authors Like Mittal A et al. Mechanism is due increased absorption of cholesterol from intestine and decreased clearance of it and LDL from plasma and also there is a reduction in the activity of lipoprotein lipase and hepatic lipase which is key regulator of triglycerides leading to its elevation.[3]

In our study showed decrease in total cholesterol and LDL levels which are showing significant correlation with the other studies. In hyperthyroidism HMG – CoA reductase activity is increased which leads to decrease in the levels of total cholesterol, LDL-C, ApoB and Lp(a) and also increased LDL receptor gene expression leading to increased catabolism of LDL.[17] Increase of CETP mediated transfer of cholesteryl esters from HDL to VLDL leads to reduction of HDL cholesterol level.

4. Conclusion

In the conclusion we want to establish how the thyroid hormone variation will be affecting the iron and lipid profile status. In this study we can guide the patients to get better outcome and better prognosis. To establish the better relationship we have to further study this by taking larger sample size.

5. Source of Funding

None.

6. Conflict of Interest

The authors declare no conflict of interest.

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