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HYPOTHYROIDISM EFFECTS ON LIVER FUNCTION

Biochemistry

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ABSTRACT

Background: The liver plays the dominant part in thyroid hormone metabolism. Normal circulating thyroid hormone levels are essential for both normal hepatic circulation and normal bilirubin metabolism. Study aimed to estimate the liver enzymes AST, ALT and ALP in overt and subclinical hypothyroidism and to compare it to that of apparently normal euthyroid controls. **Material and method:** Institutional ethics clearance was obtained for this present cross sectional observational study which was conducted on 50 patients of hypothyroidism attending OPD clinics at Bowring and Victoria Hospitals between the age of 18-55 years. Among them 20 were diagnosed with overt hypothyroidism and 30 with subclinical hypothyroidism. To compare, a 50 Healthy subjects were included as controls. Venous blood samples collected in plain clot activated tube from cases and controls after obtaining the informed consent under all aseptic precautions. The sample was centrifuged after 15 mins and was analyzed for serum levels of T3, T4, TSH, AST, ALT and ALP on fully auto-analyser. **Result:** Study included a total of 100 patients, among whom 50 were healthy controls and other 50 were with hypothyroidism. The mean age of hypothyroid subjects was 45.31 ± 4.12 years and that of euthyroid normal subjects was 44.95 ± 4.55 years. Hypothyroid consisted of overall 75% women were as the euthyroid group had 72% women. Mean AST levels in cases (35.62 ± 5.31 IU/L) was significantly higher (P < 0.01) as compared to controls (24.06 ± 4.40 IU/L) **Conclusion:** Hypothyroidism has association with increase in AST levels and ALT, ALP levels and such patients should be monitored regularly for liver function. Early detection and treatment will prevent further disorder-related complications and will be beneficial during thyroid patient care.

KEYWORDS

Hypothyroidism, Euthyroid, Liver function test, Thyroid Hormone.

INTRODUCTION:

The liver plays the dominant part in thyroid hormone metabolism. Hypothyroidism or underactive thyroid is a common endocrine disorder. Thyroid Hormones are known to affect the rate of metabolism in different organs of the body like the liver. Hence any disturbances in their levels will alter the functioning of these organs.

Thyroid disorders are the most severe among all endocrine disorders and hypothyroidism is more prevalent than hyperthyroid and thyroid carcinoma. Hypothyroidism is the state of illness caused by the thyroid glands inadequate development of thyroid hormones. Both thyroid hormones (T4 and T3) control metabolism levels, influence development and modulate energy use by increasing the basal metabolic rate and increasing the intake of oxygen and promoting heat production.

Normal circulating thyroid hormone levels are essential for both normal hepatic circulation and normal bilirubin metabolism. Dysfunctional thyroid can disrupt liver function and vice versa.

In this study we have estimated the liver enzymes in hypothyroid patients and compared it with age and sex matched euthyroid controls. However to be the best of our knowledge no study for isolated increase in AST levels in hypothyroidism in the Indian population has been documented.

This study aimed to estimate the liver enzymes AST, ALT and ALP in overt and subclinical hypothyroidism and to compare it to that of apparently normal euthyroid controls.

METHOD AND MATERIALS: Institutional ethics clearance was obtained for this present cross sectional observational study which was conducted on 50 patients of hypothyroidism attending OPD clinics at Bowring and Victoria Hospitals between the age of 18-55 years. Among them 20 were diagnosed with overt hypothyroidism and 30 with subclinical hypothyroidism. To compare, a 50 Healthy subjects were included as controls. Venous blood samples collected in plain clot activated tube from cases and controls after obtaining the informed consent under all aseptic precautions. The sample was centrifuged after 15 mins and was analyzed for serum levels of T3, T4, TSH, AST, ALT and ALP on fully auto-analyser. Liver function test was analyzed in Beckman AU480 system, liver enzymes like AST, ALT and ALP by IFCC method and thyroid Hormones Analyzed in Access 2 immunoassay system.

Statistical analysis: All the data was entered in Microsoft excel sheet and the data was analysed using SPSS v23 software operating on windows. The descriptive data was represented with frequency, percentage, bar charts and pie charts. The continuous data was presented as Mean, SD, IQR. The significance of mean difference between the continuous groups was analysed using students t-tes analysis, strength of association between the variables was analysed using Pearson's correlation. A p value <0.05 was considered as statistically significant.

RESULTS: Study included a total of 100 patients, among whom 50 were healthy controls and other 50 were with hypothyroidism. Among the hypothyroid diagnosed patients, 20 were with overt hypothyroidism and 30 were with subclinical hypothyroidism. The mean age of hypothyroid subjects was 45.31 ± 4.12 years and that of euthyroid normal subjects was 44.95 ± 4.55 years. Hypothyroid consisted of overall 75% women were as the euthyroid group had 72% women.

Cases of overt and subclinical hypothyroidism showed statistically significant increase in AST levels in serum. Mean AST levels in cases (35.62 ± 5.31 IU/L) was significantly higher (P < 0.01) as compared to controls (24.06 ± 4.40 IU/L)

Table 1: comparison of LFT analytes between the hypothyroid subjects and euthyroid subjects using t-test.

Parameters	Cases (Hypothyroid) Mean ± SD	Controls (euthyroid) Mean ± SD	p-value
T3	0.68 ± 0.37	1.06 ± 0.19	<.001**
T4	7.17 ± 4.61	9.12 ± 2.02	<.001**
TSH	45.52 ± 37.31	2.46 ± 1.38	<.001**
AST	35.62 ± 5.31	24.06 ± 4.40	0.0115*
ALT	27.02 ± 7.07	22.38 ± 3.38	<.05*
ALP	108.12 ± 43.77	93.64 ± 45.14	0.135

Total Bilirubin	0.72 ± 0.18	0.572 ± 0.14	0.274
Direct Bilirubin	0.55 ± 0.25	0.18 ± 0.06	0.07
**p-value <0.001 is statistically highly significant, p-value <.05 is statistically significant. TSH – Thyroid stimulating Hormone, AST – Aspartate Transaminase, ALT – Alanine Transaminase, ALP – Alkaline phosphatase.			

DISCUSSION: The findings of this study help to explain the complex relationships between the thyroid gland and major organs such as the liver. Liver is an important organ in the metabolism of thyroid hormone and normal level of thyroid hormone is important for the normal functioning of the liver. A highly significant disparity between the study group and the control group was found in serum TSH, T4, and T3. The study subjects were divided into two groups based on the thyroid levels.

There is no significant difference among the levels of the serum total bilirubin, direct bilirubin and ALP levels between the groups, these findings are similar with the previous studies.

Although majority of the patients show no other clinical or biochemical feature of the liver impairment. However, there is an elevated level of serum ALT and AST in the patients with hypothyroidism which was statistically significant, which was documented by various other authors. —— This may also be attributed to myopathies which are usually associated with hypothyroidism.

The link between the hypothyroidism and altered levels of liver enzymes is documented and also correlated with various other hepatic disorders. There is a significant link between the severity of cirrhotic liver and the hypothyroidism. serum level of AST is also elevated in the cardiac and muscle disorders as the enzyme rich in these sources. As the patients were with no cardiac ischemic episodes, the elevation in the AST cannot be due to cardiac abnormality. The elevated levels of the AST, ALT and ALP could be due to the hypothyroidism and drugs used in treatment by propylthiouracil. (11)

The hepatic injury sub clinically can occasionally develop over few months of initiation of the therapy. The elevation of markers is dose related and found highest during the first few weeks of treatment commencement. (5.6) There are also evidence that the hypothyroidism may directly affect the live structure and function, and associated with few cases of cholestatic jaundice due to reduced bilirubin and bile excretion and also decreased activity of UDP-glucoronyltransferase. (12)

CONCLUSION: Hypothyroidism has association with increase in AST levels and ALT, ALP levels and such patients should be monitored regularly for liver function. Early detection and treatment will prevent further disorder-related complications and will be beneficial during thyroid patient care. A multisystem approach should be taken to assess and treat patients with hypothyroidism in order to avoid ignoring subtle but clinically relevant hepatic irregularities.

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