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Original Research

Assessment of effect of thyroid hormones on liver function

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ABSTRACT:

Background: The condition known as hypothyroidism is brought on by the thyroid gland producing insufficient amounts of thyroid hormones. The present study was conducted to assess effect of thyroid hormones on liver function. **Materials & Methods:** 70 primary hypothyroid patients of both genderswere kept in group I and age matched healthy euthyroid subjects in group II. 5 ml of venous blood was collected in plain Vacutainer from antecubital vein from each patient. Estimation of thyroid profile was done using a Chemiluminescence method. Serum aspartate transaminase (AST), alanine transaminase (ALT) and alkaline phosphatase (ALP) were estimated using IFCC recommended methods. **Results:** The mean T3 level in group I was 0.24 and in group II was 0.91. T4 was 2.7 in group I and 8.6 in group II. TSH was 54.2 in group I and 3.2 in group II. The difference was significant (P< 0.05). In group I and group II, ALP was 143.2 and 79.5, AST was 74.2 and 35.6, ALTwas 70.5 and 32.7, TP was 8.5 and 7.2 and albumin was 4.6 and 4.3 respectively. The difference was significant (P< 0.05). **Conclusion:** Thyroid disorders may have a major impact on the metabolism of different cells, including hepatocytes, as evidenced by a rise in the biochemical parameters of the liver function test and a strong link with thyroid profile test components.

Keywords: hypothyroidism, liver function, Serum aspartate transaminase

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INTRODUCTION

The condition known as hypothyroidism is brought on by the thyroid gland producing insufficient amounts of thyroid hormones.[1] Thyroid hormones have a significant impact on oxygen consumption and metabolic rate and are necessary for the healthy growth, development, and operation of almost all tissues. In the general population, it is a prevalent metabolic condition. Particularly in women, thyroid dysfunction worsens with age.[2] If patients with subclinical hypothyroidism (normal T4, elevated TSH) are included, the prevalence of primary hypothyroidism, which is 1:100, might be as high as 5:100.[3]

The prohormone T4, the primary secreted by the thyroid, is activated in peripheral tissues through outer ring deiodination to T3. These processes are catalyzed by three homologous iodothyronine deiodinases.[4] The thyroid, kidney, and liver contain type I deiodinase. Furthermore, the liver plays a significant part in the metabolism and transportation of thyroid hormones. All cells, including hepatocytes, have a basal metabolic rate that is controlled by thyroid hormones.[5] Thyroid hormones are metabolized by the liver, which also controls their systemic endocrine actions. The liver glucuronidates and sulphates thyroid hormones, which are then expelled as bile.Studies with I131 have demonstrated that the liver extracts 5–10% of plasma T4 in a single passage.[6] A significant amount of protein-bound T4 is accessible for uptake, as evidenced by this number, which is far greater than what can be explained by the quantity of free T4 supplied to the liver. T4 and T3 are transported across the hepatocyte membrane via an active stereospecific transport mechanism.[7]The present study was conducted to assess effect of thyroid hormones on liver function.

MATERIALS & METHODS

The study was carried out on 70 primary hypothyroid patients of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were kept in group I and age matched healthy euthyroid subjects in group II.5 ml of venous blood was collected in plain Vacutainer [BD Biosciences]

from antecubital vein from each patient.Estimation of thyroid profile was done using a Chemiluminescence method.Serum aspartate transaminase (AST), alanine transaminase (ALT) and alkaline phosphatase (ALP) were estimated using IFCC recommended methods. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Assessment of thyroid profile

Thyroid profile	Group I	Group II	P value
T3	0.24	0.91	0.03
T4	2.7	8.6	0.04
TSH	54.2	3.2	0.01

Table I, graph I shows that mean T3 level in group I was 0.24 and in group II was 0.91. T4 was 2.7 in group I and 8.6 in group II. TSH was 54.2 in group I and 3.2 in group II. The difference was significant (P< 0.05).

Graph I Assessment of thyroid profile

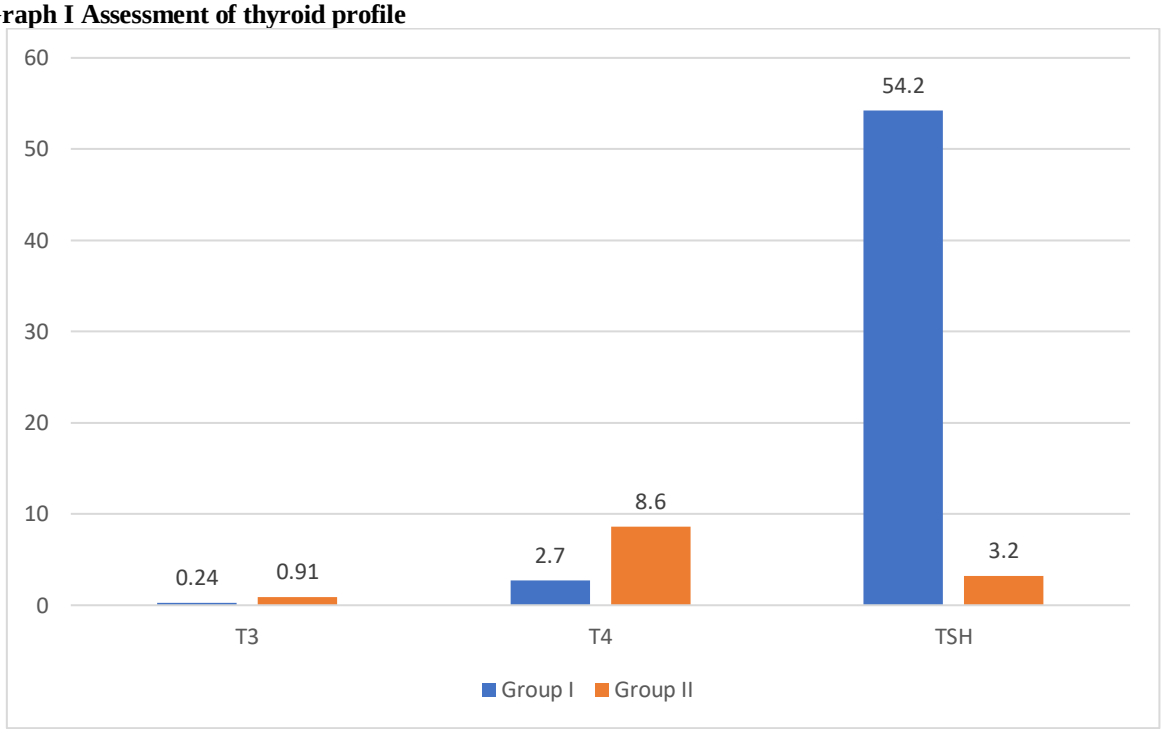
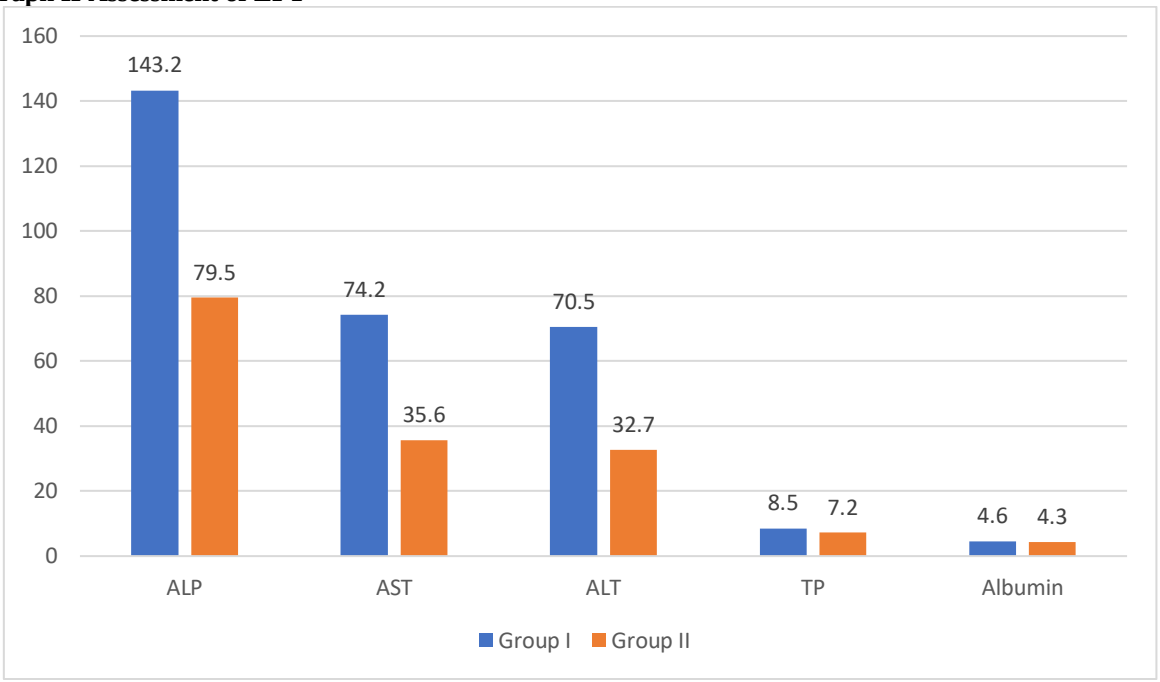


Table II Assessment of LFT

LFT	Group I	Group II	P value
ALP	143.2	79.5	0.01
AST	74.2	35.6	0.02
ALT	70.5	32.7	0.03
TP	8.5	7.2	0.05
Albumin	4.6	4.3	0.94

Table II, graph II shows that in group I and group II, ALP was 143.2 and 79.5, AST was 74.2 and 35.6, ALT was 70.5 and 32.7, TP was 8.5 and 7.2 and albumin was 4.6 and 4.3 respectively. The difference was significant (P< 0.05).

Graph II Assessment of LFT



DISCUSSION

Normal thyroid function depends on a healthy thyroid and liver axis and is necessary for normal cell growth, development, and regulation of energy metabolism.[8] Liver disease influences thyroid hormone metabolism, thyroid dysfunction can impact liver function, and other systemic diseases impact both organs.[9,10] Hypothyroidism may have features that mimic liver disease (pseudo-liver disease): examples include myalgias, fatigue and muscle cramps in the presence of an elevated aspartate amino transferase from a myopathy.[11,12]The present study was conducted to assess effect of thyroid hormones on liver function.

We found that t h e mean T3 level in group I was 0.24 and in group II was 0.91. T4 was 2.7 in group I and 8.6 in group II. TSH was 54.2 in group I and 3.2 in group II. Yadav Aet al[13]determined the biochemical markers (especially enzymes and proteins) of Liver Function Test (LFT) in patients with hypothyroidism and their possible correlation with thyroid profile. Subjects with primary hypothyroidism had significantly raised serum AST, ALT, ALP and total protein levels when compared to controls.

We observed that in group I and group II, ALP was 143.2 and 79.5, AST was 74.2 and 35.6, ALT was 70.5 and 32.7, TP was 8.5 and 7.2 and albumin was 4.6 and 4.3 respectively. Targher G et al[14]assessed the relationship between serum liver enzyme activity and thyroid function tests in a cohort of adult individuals.Cumulative results for serum GGT, ALT and TSH concentrations were retrieved for 10 292 (68.3% females) outpatient adults with a wide range of age and thyroid function tests. Subjects were categorized according to serum TSH concentrations as follows: < 0.1, 0.1-0.35, 0.36-4.5, 4.6-10 and >10 mU/l. Serum GGT and ALT concentrations increased steadily across the increasing TSH categories ($P < 0.0001$ for trends), ranging from mean values of 36 to 62 U/l for GGT and from 29 to 41 U/l for ALT, respectively. Similarly, there was a negative, graded, relationship between serum GGT and ALT concentrations and free T4 categories. The results did not change after adjusting for gender, age, lipids and fasting glucose concentrations.

Arora et al[15]evaluated the changes in biochemical markers of liver and kidney function in hypothyroid subjects before and after treatment. The study included 176 subjects randomly selected from Thyroid clinics. Serum T(3), T(4), TSH, Liver and Kidney Function tests were analysed using standard kits. Forty-six hypothyroid patients were re-evaluated 6 weeks after thyroxine substitution therapy. Hypothyroid subjects (n=80) showed significantly raised serum creatinine and uric acid levels as compared to euthyroid subjects (n=96). After 6 weeks of thyroxine replacement, serum creatinine and uric acid decreased significantly and were comparable to euthyroid group. A positive correlation of ALT, AST, uric acid, protein and albumin with TSH levels ($p<0.05$) and negative correlation of serum T(4) levels with ALT, AST, proteins ($p<0.05$) was observed in the hypothyroid group. Hypothyroidism results in reversible impairment of hepatorenal function.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that thyroid disorders may have a major impact on the metabolism of different cells, including hepatocytes, as evidenced by a rise in the biochemical parameters of the liver function test and a strong link with thyroid profile test components.

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