

Alanine Aminotransferase Activity in Hypothyroid Patients: A Cross Sectional Study

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Abstract

Background: Hypothyroidism is associated with many biochemical abnormalities including increased serum alanine aminotransferase activity. Very few studies have been done regarding serum alanine aminotransferase activity in hypothyroid patients and, as far we know, no such study has been done in our populations. So, we designed this study in our population for evaluation of serum alanine aminotransferase activity in hypothyroid patients. The objective of this study was to assess serum alanine aminotransferase activity in hypothyroid patients and to find out relationship of alanine aminotransferase activity with severity of hypothyroidism. **Methods:** It was a retrospective cross sectional study to evaluate the serum alanine aminotransferase activity of hypothyroid patients and to find out relationship of alanine aminotransferase activity with severity of hypothyroidism and the values were compared with that of age and sex matched healthy euthyroid controls. Statistical analyses were performed by using SPSS for Windows version 12.0. Unpaired 't' test was done to find out any significant difference between the cases and controls with respect to age and serum alanine aminotransferase activity. Chi-square test was done to find out any significant difference between the cases and controls with respect to sex. Pearson correlation coefficient test was done to see the correlation of alanine aminotransferase activity with the severity of hypothyroidism. **Results:** Mean serum alanine aminotransferase activity was found significantly higher in hypothyroid patients compared to that of controls. **Conclusion:** Results of our study suggest that increased serum alanine aminotransferase activity is associated with hypothyroidism. Therefore, patients presenting with increased ALT activity with normal liver function tests are recommended to be investigated to explore hypothyroidism.

Key words: Hypothyroidism; ALT activity; Metabolic derangement.

INTRODUCTION

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, which in turn results in a generalized slowing down of metabolic processes¹. It is a common metabolic disorder in general population². The thyroid dysfunction increases with age, especially in women³. The prevalence of primary hypothyroidism is 1 : 100, but it may be 5 : 100 if patients with subclinical hypothyroidism (normal T₄, raised TSH) are included⁴. According to a study done by Sawin et al⁵, hypothyroidism is a common disorder with a prevalence rate up to 20%. In another cross-sectional study on twelve hundred and twelve subjects of both sexes and age 20–60 years, the incidence of subclinical hypothyroidism was 19.7%⁶. Hypothyroidism is associated with many biochemical abnormalities and so it is of paramount clinical importance to have proper knowledge of these abnormalities and accurate estimation of these biochemical parameters is very important and useful for clinical management of the patients. Very few studies have been done to assess serum alanine aminotransferase (ALT) activity of hypothyroid patients and as far we know, no such study has done in our populations. So, we designed this study in our population for evaluation of serum ALT activity in hypothyroid patients and that might be helpful for clinical management of hypothyroid patients with abnormal ALT activity.

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MATERIALS AND METHODS

This cross sectional study was carried out in the Department of Clinical Biochemistry, Bangladesh Institute of Health Sciences, Dhaka during the period July 2012 to June 2013 to evaluate the serum ALT activity of hypothyroid patients and to find out relationship of ALT activity with severity of hypothyroidism and the values were compared with that of age and sex matched healthy euthyroid subjects. Clinically and biochemically newly diagnosed 80 hypothyroid patients of both sexes, age 20 to 60 years, with no history of thyroxine or any other medication that can influence thyroid hormone status and/or ALT activity in the last 3 (three) months were included in the study. Patients with chronic renal failure, diabetes mellitus, liver diseases, chronic diseases, pregnancy and age less than 20 and more than 60 years were excluded. Hypothyroidism was diagnosed by clinical history, physical examinations and relevant laboratory investigations. Total 146 subjects were included in the study and out of them 80 overt hypothyroid patients were grouped as cases and age and sex matched 66 euthyroid subjects were grouped as controls. Specimen was collected taking aseptic measures, allowed to clot, serum was separated and analyzed for ALT activity.

Statistical analysis

Statistical analyses were performed by using SPSS for Windows version 12.0. Mean values of the findings were compared between groups. Unpaired 't' test was done to see the significance between groups. Chi-square test was done to find out any difference with respect to sex distribution between cases and controls. Pearson correlation coefficient test was done to see the correlation of serum ALT activity with serum TSH and FT₄ levels. 'p' values <0.05 were considered significant.

RESULTS

Table I shows the age distribution of study subjects and Table II shows the sex distribution. There was no significant difference between the cases and controls with respect to age and sex. Table III shows the comparison of the serum ALT levels between the cases and the controls. Mean serum ALT levels were found significantly increased in cases as compared to controls.

Table 1: Age distribution of study subjects (N=146)

Study subjects	Age in years	t value	'p' value
Cases (n= 80)	32.66 ± 10.19	0.449	0.654
Controls (n=66)	31.79 ± 13.35		

Table 2: Distribution of study subjects by sex (N=146)

Study subjects	Male	Female	χ ² value	p value
Cases (n= 80)	13	67	0.992	0.229
Controls (n=66)	7	59		

Table 3: Comparison of serum ALT levels between cases and controls

Study subjects	Serum ALT (U/L)	t value	'p' value
Cases (n= 80)	36.53 ± 18.72	2.921	0.004
Controls (n=66)	28.20 ± 15.01		

Fig 1 shows correlation of serum ALT levels with serum TSH levels, serum ALT levels correlate positively with serum TSH levels ($r=0.192$; $p=0.036$). Fig 2 shows correlation of serum ALT levels with serum free thyroxine level, serum ALT level correlates negatively with serum FT₄ levels ($r=-0.211$, $p=0.021$).

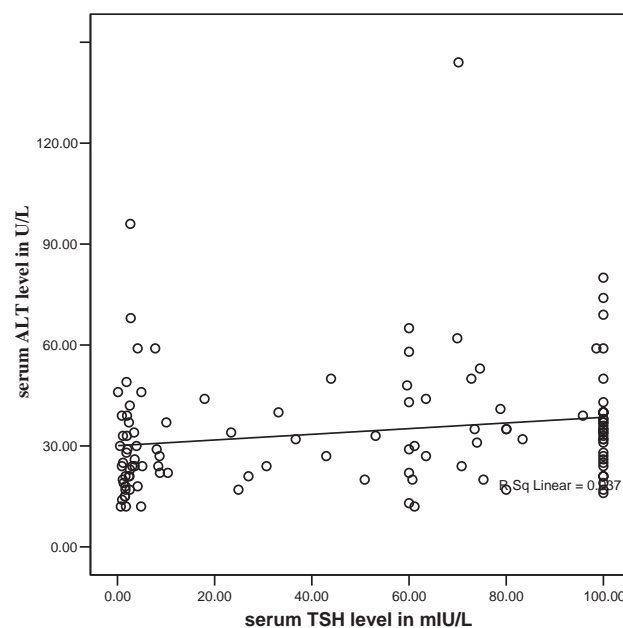


Figure 1 : Correlation of serum ALT levels with serum TSH levels

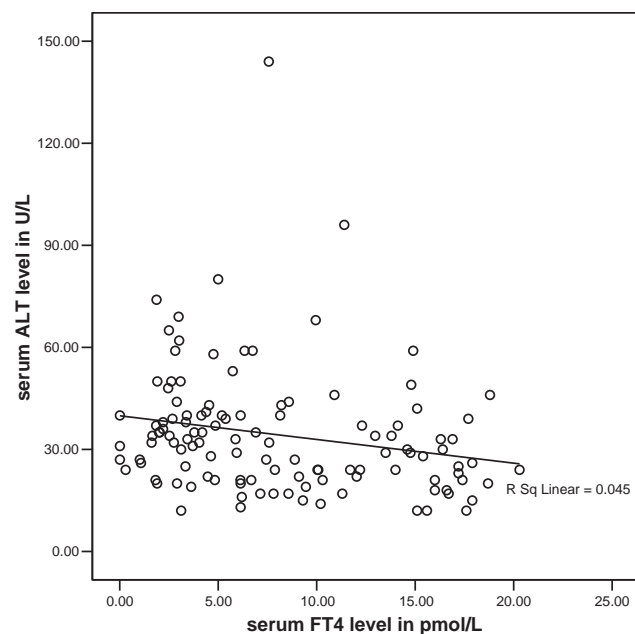


Figure 2 : Correlation of serum ALT levels with serum FT₄ levels

DISCUSSION

In this study, mean serum ALT levels in cases were found significantly higher than in the control subjects. This finding is consistent with the previous studies done by other investigators⁷⁻¹⁰. Mean serum ALT level in a hypothyroid case was found significantly greater in comparison to euthyroid value in a study done by Ohkubo et al⁷. In this study researchers reported a case of a 2-year-old male child with ring chromosome 18 who developed hypothyroidism and liver dysfunction. Transaminase level became normal after he was given levothyroxine therapy to achieve the euthyroid state, but repeatedly became elevated when levothyroxine was inadvertently discontinued. A maintenance dose of levothyroxine has effectively maintained the euthyroid state and normalized liver function tests despite no immunosuppressive therapy. In another study Targher et al⁸ found hypothyroidism associated with slightly increased serum ALT activity. Goncales et al⁹ in their study also found hypothyroidism associated with increased ALT levels. Chung et al also found ALT levels increased in hypothyroid subjects compared with normal controls¹⁰. But in another study, Gow et al¹¹ have shown higher activities of ALT when patients with spontaneous primary hypothyroidism are given oral doses of thyroxine. In their study on prepubertal and adolescent beta-thalassemic

hypothyroid patients with iron overload, De Sanctis et al¹² have shown that TSH peak values correlated directly with ALT. In some studies increased ALT activity has been found also in hyperthyroidism^{13,14}.

In our study we found ALT activity significantly increased in hypothyroid subjects compared to euthyroid controls, which is consistent with some other studies. In some studies ALT levels were found increased when spontaneous primary hypothyroidism was treated with thyroxine. Increased ALT activity has also been found in hyperthyroidism. All these inconsistent causes behind increased ALT activity force us to draw inference that metabolic derangement due to dysthyroidism might be the cause of increased ALT activity. But how this metabolic derangement causes increased ALT activity is not clear. It can only be postulated that because of abnormal thyroid hormone levels there may be derangement of biochemical reactions within the hepatic cells leading to either increased synthesis of hepatic enzymes or increased permeability of hepatic cell membranes or both. However, more studies with larger number of subjects in different settings and research at the basic molecular level are recommended to explore the basic mechanism of high ALT activity in thyroid derangements.

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