Original Research Paper

Biochemistry

ELEVATED PSEUDOCHOLINESTERASE LEVELS IN HYPERTHYROIDISM

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ABSTRACT

Background : Serum Pseudocholinesterase levels are used as an indicator of exposure to various insecticide poisoning. Pseudocholinesterase is a glycoprotein enzyme, produced by liver and circulating in plasma. Pseudocholinesterase plays a role in metabolic degradation of exogenous choline ester drugs. Studies have also shown association of many pathological conditions such as liver disease, obesity, nodular goitre with Pseudocholinesterase levels. The present study was carried out to evaluate the serum Pseudocholinesterase levels in newly diagnosed hypothyroid and hyperthyroid patients.

Methodology : A Case control study was done on newly diagnosed hypothyroid and hyperthyroid patients (17 hypothyroid and 17 hyperthyroid patients and 17 healthy volunteers)

Results: The age group of the population under study was 20-40 years. The serum levels of TSH in normal, hypothyroid and hyperthyroid groups were 2.5±1.0 uIU/mL, 13±7.3 uIU/mL and 0.22±0.15 uIU/mL. The serum values of Pseudocholinesterase in normal, hypothyroid and hyperthyroid groups were 4038±1157U/L, 4663±1376U/L, 13781±1840U/L respectively, Serum Pseudocholinesterase levels showed significant increase (3.4 times higher than normal) in hyperthyroid group (p<0.0001). We found a significant negative correlation between serum Pseudocholinesterase levels and TSH levels (Spearman r coefficient = -0.5; p<0.0001)

Conclusion: High Serum Pseudocholinesterase levels can be used as an indicator to screen disruption in thyroid activity.

KEYWORDS : Pseudocholinesterase, hypothyroid, hyperthyroid

INTRODUCTION

Cholinesterases are enzymes classified by Mendel and Rudney into "true" cholinesterase or acetyl cholinesterase present in erythrocytes and glial tissues; and "pseudo" (succinyl or butyryl or serum) cholinesterase, present in serum and synthesized in the liver. Acetylcholinesterase mainly in chemical synapses and red blood cells catalyzes the breakdown of neurotransmitter acetylcholine. Pseudocholinesterase is a glycoprotein mainly found circulating in plasma plays a role in metabolic degradation of exogenous choline ester drugs. It has no known physiological function.

Serum pseudocholinesterase levels are commonly used as an indicator of exposure to various insecticide poisoning, the enzyme levels decrease mainly due to organophosphate poisoning. The value of serum cholinesterase estimation as a test of liver function has been well studied, particularly to assess progress of chronic liver disease; low levels in cirrhosis may serve as a useful prognostic marker of advanced liver disease.[1,6] Quantitative deficiencies are also observed in pregnancy, malignancies, malnutrition, collagen vascular disease, thermal injury, with the use of certain medications (glucocorticoids, estrogens, echothiophate, bambuterol, phenelzine, and cyclophosphamide) and hypothyroidism.[7] Studies have shown that its activity increases in diseases of autoimmune nature, and decreases in metabolic pathology thereby allowing for differentiation of autoimmune diseases from the diseases of another origin, but with similar symptoms.[3,8,9] Low plasma Pseudocholinesterase levels are also found in protein energy malnutrition and inflammatory states.[2]

In an attempt to explore the value of Pseudocholinesterase testing for further applications, the present study was carried out to evaluate the serum Pseudocholinesterase levels in hypothyroid and hyperthyroid patients and to assess the correlation between Serum TSH and Serum Pseudocholinesterase level. The two main thyroid diseases, hypothyroidism and hyperthyroidism encountered have a wide impact on various metabolic pathways. Decreased levels of Serum cholesterol and beta-lipoproteins occurring in hyperthyroidism were found to be accompanied by an enhanced activity of pseudocholinesterase.[7] This behaviour of Pseudocholinesterase levels and lipid profile could be used for the evaluation of thyroid disease.[4,5,10]

MATERIALS AND METHODS

Study Type

A Case control study was conducted on 17 healthy volunteers, 17 newly diagnosed hypothyroid patients and 17 newly diagnosed hyperthyroid patients at a tertiary care hospital. Variables measured were Age, TSH and Serum Pseudocholinesterase activity. Inclusion criteria are newly diagnosed hypothyroid and hyperthyroid patients under the age group of 20-40 years. The diagnosis was established based on their TSH values. For control group, age and sex matched healthy volunteers were included. Exclusion criteria were patients who were on treatment for thyroid disease, hypolipidemic drugs, pregnancy, any liver disorder, renal disorder and cancer.

5mL of fasting venous blood sample was collected in a plain serum tube and centrifuged at 3000rpm for 10 minutes and serum was separated and used for estimation of analytes. TSH activity was estimated by MAGLUMI 600 Chemiluminescence Immunoassay. Pseudocholinesterase activity was estimated by ERBA Autoanalyser.

Results are presented as Mean ± SD. Student t test (two tailed, independent) was used to find the significance of study parameters between the groups. To evaluate correlations between serum Pseudocholinesterase levels and TSH, Spearman's correlation test was used. Statistical analysis was done using GraphPad Prism 8 and a p value < 0.05 was considered to be statistically significant.

RESULTS

The serum levels of TSH in normal, hypothyroid and hyperthyroid groups were 2.5±1.0 uIU/mL, 13±7.3 uIU/mL and 0.22±0.15 uIU/mL respectively. The serum values of Pseudocholinesterase in normal, hypothyroid and hyperthyroid groups were 4038±1157U/L, 4663±1376U/L, 13781±1840U/L respectively (Figure 1).There was no significant difference in serum Pseudocholinesterase levels between normal and hypothyroid group.

Serum Pseudocholinesterase levels showed significant increase (3.4 times higher than normal) in hyperthyroid group (p<0.0001). We found a significant negative correlation between serum Pseudocholinesterase levels and TSH levels (Spearman's r coefficient = -0.5; p<0.0001)

## Discussion

The study was conducted in an academic interest to identify any new value for Pseudocholinesterase activity levels other than the use in routine insecticide poisoning. Pseudocholinesterase activity in diagnosis and prognosis of OPC poisoning and liver diseases are well

established. Also recent studies have established the correlation of Pseudocholinesterase with autoimmune diseases, Myocardial infarction, Cancer, Diabetes mellitus.[3,11,12]

In this study, we found that the levels of TSH and Pseudocholinesterase are inversely related. This is consistent with the findings of Kaushik GG et.al,[4] Shiju K Sleeba et al[7], who showed that elevation in Pseudocholinesterase activity in hyperthyroid patients was accompanied by an elevation in total cholesterol levels as well.

Abnormal thyroid activity reflects on the levels of thyroid hormone, and in this study, we see a possible additional effect on Pseudocholinesterase levels. This finding may help provide a potential clinical utility for Pseudocholinesterase estimation other than that in organophosphate poisoning.
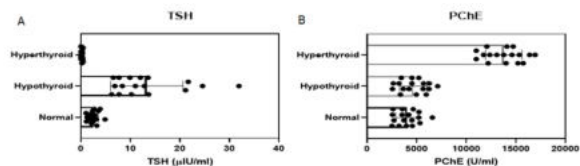
Figure 1: Serum levels of TSH (A) and Pseudocholinesterase (B) in Normal, Hypothyroid and Hyperthyroid groups

CONCLUSION
High Serum Pseudocholinesterase levels can be used as an indicator to screen disruption in thyroid activity.

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