International Journal of Medical Science and Education

www.ijmse.com

Original Research Article

pISSN- 2348 4438 | eISSN-2349- 3208

ASSESSMENT OF SERUM AST, ALT, GGT & ALP LEVELS IN PATIENTS WITH THYROID FUNCTION ALTERATIONS

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Received:28/02/2019 ***Revised:14/05/2019*** ***Accepted:09/06/2019***

ABSTRACT

Background: Thyroid function alterations causes alterations in various enzymes. AST, ALT, GGT and ALP are among the significant ones. Objective: To establish significance of change and find out the relationship between alteration in thyroid function and various Enzyme levels. **Materials and Method:** In the present Cross Sectional study, samples of 100 cases (50 for hyperthyroidism and 50 for hypothyroidism) and 50 controls (normal healthy persons) were selected from Civil Hospital Ahmedabad (CHA), Gujarat.Serum AST, serum ALT, serum GGT and serum ALP levels were measured on XL-640 fully-auto biochemical analyser. **Results:** Results showed increase in serum AST, ALT, GGT and ALP in patients with altered thyroid function compared to normal subjects. **Conclusion:** This study clearly revealed a significant relationship between increased serum enzyme AST, ALT, GGT & ALP in hyperthyroidism and hypothyroidism.

Keywords: Aspartate Aminotransferase (AST), Alanine Aminotransferase(ALT), Gamma Glutamyl Transferase (GGT), Alkaline phosphatase (ALP)

INTRODUCTION:

The thyroid is a small butterfly shaped endocrine gland, located in the lower part of the neck, in front of the windpipe which secretes thyroid hormones. The hormones released by the thyroid are T3 and T4; supply energy to cells of the body. Thyroid hormone synthesis and secretion is regulated by a negative feedback system that involves the hypothalamus, pituitary, and the thyroid gland **(1)**

Thyroid hormones are important in metabolism—they convert oxygen and calories into to energy for use by the cells and organs. When the thyroid gland is normal, it produces and secretes the amount of T4 and T3 necessary to keep various body functions in normal state.**(1)**

The thyroid gland is a usually common target of disease or dysfunction. Thyroid disorders are mainly classified into two major categories, hyperthyroidism (caused by an overactive thyroid gland) and hypothyroidism (due to a poorly functioning thyroid gland), depending on whether serum thyroid hormone levels (T4 and T3) are increased or decreased, respectively. Hypothyroidism as well as hyperthyroidism have potentially fatal systemic manifestations **(1, 2)**

The main symptoms related to hyperthyroidism are weight loss, anxiety, irritability, trouble sleeping, rapid or irregular heartbeat, trembling in the hands and fingers, increased sweating, increased sensitivity

to heat, muscle weakness, etc. The symptoms of hypothyroidism are weight gain, cold intolerance , muscle weakness, muscle pain, depression, fatigue, pale dry skin, a puffy face, a hoarse voice, etc**.(3)**

Subclinical hypothyroidism occurs in case where TSH levels is elevated while T3 and T4 levels are normal. Subclinical hyperthyroidism is characterized by a low or undetectable concentration of serum TSH with FT3 and FT4 levels within normal reference ranges. Euthyroidism is the state of normal functioning of thyroid gland. Since thyroid hormones are crucial for normal growth and development, function and regulate the BMR of the cells, alteration in its level can affects the metabolism. Commonly affected organs include liver and heart. So, it alters the liver enzymes like ALP, AST, ALT & GGT. **(1, 4)**

Therefore, appropriate and timely diagnosis of thyroid abnormalities is very much important for physicians as well as medical laboratories across the world for proper management. Laboratory measurements of T3, T4 and TSH are more relavant in helping physicians to diagnose thyroid abnormalities.

From the study done in Civil hospital - Ahmedabad, it was found that the prevalence of thyroid dysfunction was 23%. Hypothyroidism (9%) and subclinical hypothyroidism (7%) have higher prevalence compared to subclinical hyperthyroidism (4%) and hyperthyroidism (3%). Higher prevalence of thyroid dysfunction was observed in subjects with age above 30 years. According to comparison with contemporary studies it is observed that thyrotoxicosis has a significant effect on liver that is reflected in increased level of liver specific enzymes i.e., AST, ALT and ALP. In particular, there is a significant correlationship between serum TSH, ALT and GGT activities in the normal and high TSH ranges. In other study, S.CPK level shows an inverse relationship with serum T3, T4 levels. **(5, 6, 7, 8)**

Thyroid dysfunction is one of the major community health problems in India. Laboratory tests can help in early diagnosis before clinical features are reflected. Laboratory tests along with supportive clinical findings are commonly used to diagnose thyroid alteration. **(1)**

MATERIALS AND METHOD

In the present Cross Sectional study, samples of 100 cases (50 for hyperthyroidism and 50 for hypothyroidism) and 50 controls (normal healthy persons) were selected from Civil Hospital Ahmedabad (CHA), Gujarat. The study was conducted during the period of June-2017 to December-2018. Informed oral consent was obtained from each of the individuals. Due permission was taken from the concerned authority of the institution.

Inclusion Criteria: Individual of both the sexes fall under the age group of 20 - 60 and who do not have any chronic condition other than thyroid alteration are included in this study. Both newly diagnosed as well as previously diagnosed individuals were included based on the values of FT3, FT4 and TSH. **(1)**

Exclusion Criteria : The individuals were excluded in this study who were having liver disease, bone and muscle disease, cardiac, pancreatic or hepatobillary disease, diabetes hypertension (HT), malignancy, oral contraceptive pills (OCP), pregnancy and drug abusers.

Data Analysis: Data was statistically analyzed by Graphpad software; Version 6.0, which evaluated the differences of various parameters within groups on the basis of p value.

Biochemical Analysis: For analysis of serum enzyme AST, ALT, GGT & ALP, after explaining to the patients and with proper consents, venous blood was collected in clot activator serum vacutte from all the patients and control group by venepuncture. Serum was separated by centrifugation and analysis was done on Chemiluminescence Immuno Assay machine – Beckman Coulter Unicel DXI 600 & Fully Automated Biochemistry Analyzer - Erba XL-640 at Hi-tech Clinical Chemistry Laboratory Services, Civil Hospital, Ahmedabad. Commercially available ready to use reagent kits were used for estimation of various parameters.

RESULTS

Table I : Thyroid Profile of the Hyperthyroidism, Hypothyroidism and Control

Parameter	Biological Reference Interval	Group-1 (Hyperthyroid) (Mean ± SD)	Group-2 (Hypothyroid) (Mean ± SD)	Group-3 (Controls) (Mean ± SD)
Serum TSH (µIU/ml)	0.4 – 4.4	0.24 ± 0.08 (0.06 - 3.12)	21.35 ± 8.60 (5.6 – 38.26)	2.61 ± 0.70 (1.24 - 4.01)
Serum FT3 (pg/ml)	2.1 – 4.4	6.09 ± 1.45 (3.68 – 9.58)	1.98 ± 1.16 (0.12 – 4.1)	3.17 ± 0.51 (2.02 - 4.05)
Serum FT4 (ng/dl)	0.8 – 2.7	3.81 ± 1.07 (2.79 – 8.26)	0.67 ± 0.34 (0.10 – 1.8)	1.60 ± 0.32 (1.01 – 2.5)

Table II : Serum Enzymes Profile of the Hyperthyroidism, Hypothyroidism and Control

Parameter	Biological Reference Interval	Group-1 (Hyperthyroid) (Mean ± SD)	Group-2 (Hypothyroid) (Mean ± SD)	Group-3 (Controls) (Mean ± SD)
Serum ALT (IU/L)	M: 0 – 45 F: 0 - 34	66.47 ± 27.87 (19.26 – 147.26)	50.0 ± 18.06 (18.03 – 92.71)	22.82 ± 5.82 (8.24 – 33.32)
Serum AST (IU/L)	M: 0 – 37 F: 0 - 31	68.95 ± 34.65 (15.78 – 145.31)	47.78 ± 19.01 (19.25 – 94.23)	23.37 ± 5.42 (8.65 – 35.03)
Serum ALP (IU/L)	M: 41 – 137 F: 39 - 118	479.93 ± 332.91 (48.27 – 1142.25)	153.88 ± 59.51 (37.25 – 450.23)	67.44 ± 20.97 (42.63– 124.65)
Serum GGT (IU/L)	M : < = 50 F: < = 30	83.66 ± 49.80 (15.36 – 241.63)	61.12 ± 25.92 (18.26 – 145.65)	20.72 ± 6.05 (9.05 – 31.52)

Table - II shows that serum ALT is increased in cases as compared to controls (66.47 ± 27.87 IU/L, 50.00 ±18.06 IU/L, 22.82 ± 5.82 respectively). So, there is highly significant difference observed in between group 1 & group 3 as well as group 2 & group3 of serum ALT ($p<0.001$).

Table – II shows that serum AST is increased in cases as compared to controls (68.95 ± 34.65 IU/L , 47.78 ± 19.01 IU/L, 23.37 ± 5.42 respectively). So, there is highly significant difference observed in between group 1 & group 3 as well as group 2 & group3 of serum ALT ($p<0.001$).

Table - II shows that serum ALP is increased in cases as compared to controls (479.93 ± 332.91 IU/L, 153.88 ± 59.51 IU/L, 67.44 ± 20.97 respectively). So, there is highly significant difference observed in between group 1 & group 3 as well as group 2 & group3 of serum ALT ($p<0.001$).

Table II shows that serum GGT is increased in cases as compared to controls (83.66 ± 49.80 IU/L , 61.12 ± 25.92 IU/L, 20.72 ± 6.05 respectively). So, there is highly significant difference observed in between group 1 & group 3 as well as group 2 & group3 of serum ALT ($p<0.001$).

DISCUSSION

In majority of the cases diagnosis is usually straightforward on clinical grounds. However, various diagnostic tests are performed for confirmation of the disease, i.e., Serum FT3, FT4 and TSH levels. It is well known that various organs biochemical abnormalities have been shown in patients with thyroid alterations. **(1)**

Authors of some previous studies reviewed the relationship between thyroid gland and liver in hyperthyroidism. Thyroid hormones T3 and T4 are essential for the growth, development and function of all organs of the body. They regulate BMR of all cells of the body including the hepatocytes and thereby modulate all the organ function.. Therefore, thyroid dysfunction may disturb liver, muscle, other organs function and vice versa. It highlights a close relationship between thyroid and various organs in health and disease. The clinical features of liver injury caused by thyrotoxicosis are relatively common and can be conveniently divided into hepatic and cholestatic types. **(9)**

In hepatic injury an increase in levels of AST and ALT were reported in 27% and 37% of the patients, respectively. Although majority of them showed no other clinical or biochemical features of liver impairment, due to oxygen demand without proper increase in blood flow. **(5, 9)**

Therefore, results of the present study along with the earlier reports are suggestive of the fact that more the serum thyroid hormones level is elevated, higher is the serum enzymes (ALT, AST, GGT, and ALP) level. Thus, showing a positive relationship between FT3, FT4 and ALT, AST, ALP and GGT levels, this is in accordance with the values reported in the previous studies. Khan T. M., Malik in his study observed significant increase in AST, ALT and ALP levels in hyperthyroid patients. Dr.G.Deepika also observed in her study the significant increase in AST, ALT and ALP levels in hypothyroid patients. **(5,9)**

Thus, considering these facts the present study clearly revealed a positive association between increased serum AST, ALT, GGT and ALP in hyperthyroidism and hypothyroidism.

CONCLUSION

The present study ascertained that thyroid disorder causes significant effect on metabolism of various cells of the body that was reflected by increased level of serum enzymes to a varying extent. Thyroid dysfunction shows a strong female preponderance. From the study, it is clear that thyroid hormones have significant effect on various organ systems of the body. During thyroid alteration, serum enzymes levels were also fluctuated. In hyperthyroid cases, the serum enzymes AST, ALT, and GGT were slightly elevated whereas, ALP shows significant elevation when compared to the controls.

In hypothyroid cases, the serum enzymes AST, ALT and GGT were only slightly increased whose mean values were less than those found in hyperthyroidism.While ALP showed a marked elevation. Thus, study clearly revealed a positive association between increased serum AST, ALT, GGT and ALP in hyperthyroidism and hypothyroidism.

Based on the results, it can be concluded that this association could lead us to newer avenues to investigate the pathophysiology and management of patients with mild to moderate abnormalities of relative organs or systems. Therefore, it necessitates the measurement of thyroid hormones in patients with abnormal serum enzymes level without any significant cause.

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How to cite this article: Gaadhe P.K., Khubchandani A., Gaadhe H., Assessment Of Serum Ast, Alt, Ggt & Alp Levels In Patients With Thyroid Function Alterations, Int.J.Med.Sci.Educ 2019;6(1):58-62