CORRELATION OF THYROID DYSFUNCTION WITH SERUM LIPID PROFILE AND ANALANINE AMINO TRANSFERASE

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ABSTRACT

Objectives: The main objective is to study the association between different degrees of thyroid dysfunction with lipids and Analanine Amino Transferase.

Material and Methods: This study was conducted in Pakistan Medical and Research Council (PMRC), Khyber Medical College, Peshawar, Pakistan from January 2014 to December 2014, Serum Alanine Amino Transferase (ALT) has been determined by the kinetic method recommended by International Federation for Clinical Chemistry (IFCC). The correlation values were calculated between two parameters i.e., Euthyroid, hyperthyroid, and hypothyroid with serum Lipid profile and serum ALT respectively. Serum Total Lipid profile was measured by applying Enzymatic Colorimetric Method. Coefficient of correlation (r) was also calculated using SPSS version 16.00 as a soft ware statistical package.

Results: In hyperthyroidism, the serum alanine amino transferase (ALT) level was elevated to some extent with mean values T3 (6.98 ± 0.367), T4 (34.75 ± 1.640), TSH (0.25 ±0.003) respectively. In hypothyroidism there is a minor increase in the serum ALT with the mean values less than those found in hypothyroidism T3 (3.31+0.128), T4 (10.71+0.637), TSH (31.47+1.628). This study clearly mentions a positive association between thyroid diseases and increased serum ALT concentration.

Conclusions: The comparison of lipid profile and serum ALT in Hyperthyroid disease is suggesting a highly significant positive relationship with TC, HDL-C and LDL-C except for TG, VLDL-C. Similarly, lipid profile and serum ALT in Hypothyroid disease is suggesting a highly significant positive relationship with all the parameters of lipids studied.

Key Words: Thyroid malfunction, Alanine amino transferase, Lipid profile, Hyperthyroidism, Hypothyroidism.

INTRODUCTION

In the metabolism of thyroid hormones, liver plays a significant role. In serum, ALT level determines normal hepatic function. This inter relation between liver and thyroid must be considered while examining patients and determining the medical problem. If this association of liver and thyroid is ignored it might result in misinterpretation of the disease.[1] Function of thyroid hormones and liver are closely related. It plays central role in deiodination to activate and deactivate thyroid hormones. Moreover the liver also regulates metabolism and the transport of thyroid hormones (THs).[2]

Studies using radioactive isotope of iodine shows that during each single passage of blood through to the liver, 5-10% of plasma T4 is extracted which is a much higher value than can be explained by the amount of free T4 delivered to the liver. This indicates the availability of a substantial amount of protein bound T4 for uptake.[3] The presence of an active and type specific transport mechanism facilitates the transportation of T3 & T4 across the hepatocyte membrane.[4]

The liver provides the resource of rapidly exchangeable circulating hormones that is done by the liver through synthesis of plasma proteins which binds the lipophilic thyroid hormones. Most of the thyroid hormones are protein bound in plasma. Within plasma, the free hormones and the protein bound hormones are in equilibrium. The hormones biological activities are credited to the free fraction. A steady concentration of free T3 & T4 ensures the same concentrations of free hormones. However it needs to be noted that the concentration of free hormone varies from tissue to tissue, depending on the transport and deiodinas activity within a particular tissue.[5]

Therefore, normal thyroid function and tissue thyroid status are dependent upon a number of factors like thyroxin secretion, normal thyroid hormone metabolism,

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normal liver axis and function, and delivery of T3 to nuclear receptors and its distribution.[6,7] Normal growth and function of all body tissues depends on thyroid hormones. On the other hand, liver plays significantly in metabolism of thyroid hormone, as normal hepatic function relies on their serum level. There is thus a close association between certain hepatic malfunctioning and hyperthyroidism.[8]

Around 64% of patients having thyrotoxicosis have a raised level of serum alanine amino transferase (ALT). It was reported that ALT levels are increased in 37% of patients.[9] Thyrotoxicosis resulting in liver injury is a relatively common observation.[10] Liver is one of the important organs for the metabolism of TC and TG. In hepatic lipid homeostasis, THs play a central role by increasing the expression of LDL receptors on the hepatocytes and thereby reducing the LDL levels due to increased activity of lipid lowering enzyme.[11,12] The association between hepatic function and hypothyroidism as yet remains too established. Scarcity of data and case studies pertaining to hypothyroid subjects is an obstacle in this regard. Another hindrance is the scarcity of information regarding liver function tests (LFTs) against TFTs.[13] Hyperthyroidism and hypothyroidism can damage liver more or less. Liver function tests should be done in long standing cases of thyroid dysfunction.

MATERIAL AND METHODS

Serum Alanine Amino Transferase (ALT) has been determined by the kinetic method recommended by International Federation for Clinical Chemistry (IFCC). The correlation values were calculated between two parameters i-e., Euthyroid, hyperthyroid, and hypothyroid with serum Lipid profile and serum ALT respectively. Serum Total Lipid profile was measured by applying Enzymatic Colorimetric Method. Coefficient of correlation (r) was also calculated using SPSS version 16.00 as a soft ware statistical package.

The study was ethically permitted by the ethical committee of Post Graduate Medical Institute (PGMI), Hayatabad Medical Complex, Peshawar, and was conducted in Pakistan Medical Research Centre (PMRC), Khyber Medical College, Peshawar, Pakistan.

RESULTS

In this study the thyroid hormones of 195 thyrotoxic patients have been compared with euthyroid controls by examining the serum levels ALT and were then compared with the thyroid profile. Their associations as well as correlation were computed for results. According to the statistical analysis, the association between TFTs and serum ALT was highly significant.

The correlation observed for TSH is positive when compared with serum Alanine Amino Transferase. The thyroid hormones however have no relation with serum Alanine Amino Transferase. The relationship between Thyroid Function Tests of Hypothyroid subjects and serum Alanine Amino Transferase shows a negative correlation for Tetra-iodo thyroxin although a strong positive correlation is observed between TSH and Tri-iodothyronine.

Serum Alanine Amino Transferase of hyperthy-

Table 1: Correlation between serum (ALT) and thyroid profile of hyperthyroid patients

Total (n=600)	Hyper (n=195)		Asso-ciation	Cor-relation
TFTs	Mean±SEM	SD	p	r
T_3	6.98±0.367	4.17	0.000**	-0.218♦
T_4	34.75±1.640	18.63	0.001*	-0.216♦
TSH	0.25±0.003	0.36	0.000**	0.105*

P**highly significant P*significant P♦non significant
r coefficient of correlation r*positive correlation
r♦negative correlation

Table 2: Correlation between serum (ALT) and thyroid profile of hypothyroid patients

Total (n=600)	Hypo (n=191)		Asso-ciation	Cor-relation
TFTs	Mean±SEM	SD	p	r
T_3	3.31±0.128	1.43	0.000**	0.143*
T_4	10.71±0.637	7.14	0.000**	–0.035♦
TSH	31.47±1.628	18.27	0.000**	0.197*

P**highly significant P*significant P♦non significant
r coefficient of correlation r*positive correlation
r♦negative correlation

Table 3: Correlation between serum Alanine AmminoTransferase (ALT) and lipid profile of hyperthyroid patients

Total (n = 600)	Hyper (n=195)		Asso-ciation	Cor-relation
TFTs	Mean±SEM	SD	p	r
TC	136.33±3.500	39.75	0.000**	0.063*
HDL-C	33.85±1.314	14.56	0.000**	0.063*
LDL-C	78.25±2.575	82.54	0.000**	0.112*
VLDL-C	24.20±1.4534	29.29	0.000**	-0.106♦
TG	121.01±7.267	16.50	0.000**	-0.106♦

P**highly significant P*significant P♦non significant
r coefficient of correlation r*positive correlation
r♦negative correlation

Table 4: Correlation between serum Alanine Amino Transferase (ALT) and lipid profile of hypothyroid patients

Total (n = 600)	Hypo (n=191)		Asso-ciation	Cor-relation
TFTs	Mean±SEM	SD	p	r
TC	175.5±5.318	59.7	0.000**	0.154*
HDL-C	36. 26±1.319	14.81	0.000**	0.084*
LDL-C	113.87±4.930	55.33	0.000**	0.058*
VLDL-C	27.53±1.4223	79.82	0.000**	0.076*
TG	137.69±7.111	15.96	0.000**	0.076*

P**highly significant P*significant P♦non significant
r coefficient of correlation r*positive correlation
r♦negative correlation

roid subjects is positively related with total cholesterol, Triacylglycerol and Lipoproteins, whereas negative correlation was found for Triglyceride as well as Very Low Density Lipoprotein Cholesterol. The relationship between lipid profile and serum Alanine Amino Transferase of the hypothyroid patients is highly significant. The results mentioned that the correlation is strongly positive for all the lipid parameters.

DISCUSSION

The basic ideology behind this research was to assess the cause of various abnormalities in thyroid function and its affect on the functioning of liver by taking into consideration selected biochemical parameter, serum ALT. The study was conducted in associated type of patients to determine the scientific relation between the said pathological conditions.

Since, no previous data was available from the area under study, the observed serum enzymes profile was compared with normal standard and correlated with thyroid hormone profile and lipid profile in cases and controls respectively. Results of the study did not differ significantly from other studies evaluating the relationship between thyroid gland and liver in hyperthyroidism declaring that thyroid hormones T3 and T4 are necessary for the growth, development and functions of the body by regulating BMR of all the cells including the hepatocytes and thereby modulate all the organ function. It highlights a close relationship between thyroid and various organs in health and disease. In type of hepatic damage an increase in levels of ALT is reported in 37% of the patients.[25] The relationship between thyroid hormones and serum enzymes levels have been well documented, though its importance as other organs dysfunction is still controversial. Findings of the present study are consistent with the previous work regarding elevated serum ALT levels in thyroid alteration. But contrary to the expectations, the correlation between thyroid and serum enzymes profile was found to be non significant which is in agreement with previous studies. Regardless of the reasons, significant alteration in serum enzymes in hypothyroidism and hyperthyroidism was not seen in enough individuals to make us feel comfortable. Lipid profile and serum ALT in Hyperthyroid patients is suggesting a highly significant positive relationship with TC, HDL-C and LDL-C. The same is negatively related to TG, VLDL-C. Similarly serum ALT in Hypothyroid disease is suggesting a positive relationship with all the parameters of lipids studied. Results of this study did not differ significantly from other studies and are in accordance with a number of studies of Khan TM, Malik R Huang MI and Biscov, VM.[8,9,26,27]

CONCLUSION

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 liver. Therefore, it necessitates the measurement of thyroid hormones in patients with abnormal serum enzymes level without any significant cause. However, further studies are required to be carried out in large sample size to confirm the findings.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Attaullah S: Concept and design, acquisition of data, final approval.
Haq BS: Drafting of manuscript.
Muska M: Data analysis.
Wadood U: Critical review, drafting of manuscript and data analysis.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.