WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 7.523
Volume 6, Issue 8, 22-30. Research Article ISSN 2277–7105

IMPACT OF THYROID DISORDERS ON SERUM ACTIVITY LEVELS OF LIVER ENZYMES, CPK AND LDH IN SUDANESE PATIENTS

Mussab Mohammed Mohammed Salih[1], Mariam Abbas Ibrahim[2]*, Altaf Suleman Mosad Taaha[2] and Tahani Osman Mohamed Alzein[1]

[1]Department of Clinical Chemistry, Faculty of Medical Laboratory Science, Sudan International University.

[2]Department of Clinical Chemistry, College of Medical Laboratory Science, Sudan University of Science and Technology.

Article Received on
23 May 2017,

Revised on 14 June 2017,
Accepted on 04 July 2017

DOI: 10.20959/wjpr20178-8915

***Corresponding Author'**
Dr. Mariam Abbas Ibrahim
Department of Clinical Chemistry, College of Medical Laboratory Science, Sudan University of Science and Technology.

ABSTRACT

Thyroid hormones exert their effect on all tissues and modulate the rate of metabolic activity. Alterations in thyroid function can affect the various organ system of body and perturb measures like AST, ALT, ALP, GGT, CPK and LDH. Both hyperthyroidism and hypothyroidism have potentially fatal systemic manifestations. The main aim of this study was to determine the relationship between thyroid alteration and serum enzymes levels. The study included 185 subjects visiting endocrinology unit of the department of clinical chemistry; ALribat University Hospital, Khartoum, with the request of Thyroid Function Test. Thyroid profile and serum enzymes were analyzed using standard kits. Our findings showed a significant increase levels of AST, GGT, CPK and LDH and no significant difference was shown in ALT and ALP when compared to controls.In conclusion enzymes ALT, GGT, CPK and LDH increased in thyroid disorders; while AST and ALP are not affected. There is a correlation between age, gender and activity of enzymes of ALT, GGT, CPK and LDH; while no correlation were found in AST and ALP. These results could be used as diagnostic parameters for thyroid disorders.

KEYWORDS: Thyroid disorders, TSH, T3, T4, AST, GGT, CPK and LDH, Sudan.

INTRODUCTION

All the body basal metabolic processes are controlled by hormones produced by the thyroid gland. When it works normally, produces and secretes the amount of Triiodothyronine (T3) and Tetrariodothyronine (T4) hormones necessary for normal organ growth, development and cellular functions.[1] Both, T3 and T4 are regulated by pituitary gland hormone called Thyroid-Stimulating Hormone (TSH). T4 is converted to T3 by removal of one iodine atom. This mostly occurs in the liver or other tissue such as the brain. T3 function as transcription factor and regulate many genes expression.[2]

Thyroid gland as all other organs is susceptible to diseases or dysfunction. The most universal cause is iodine deficiency in which many patients with autoimmune diseases. There is no obvious clinical sign and sometimes appear non-specifically. Diagnosis is entirely relied on measurements of thyroid hormones (T3, T4 and TSH) in patient's blood.

Thyroid disorders are commonly divided into two major categories Hyperthyroidism (an excess of thyroid hormone) and hypothyroidism (poorly active thyroid gland). These types are depending on the rate of the thyroid hormones synthesis and secretion. Both hyperthyroidism and hypothyroidism have potentially fatal systemic manifestations such as liver or heart failure.[3] Graves' disease and toxic nodular Goiter are two examples of Hyperthyroidism. Iodine deficiency and Hashimoto's thyroiditis are common examples of hypothyroidism.

Thyroid disorders often appear as abnormal level in serum enzymes or disturbances in liver functions. The major difficulty in diagnosis is subclinical hypo/hyperthyroidism. Which are common disorders traditionally detected by an imbalance of thyroid hormone levels, in particular, TSH.[4] In subclinical hyperthyroidism, TSH is undetectable and free T3 and T4 are within the normal ranges. While in hypothyroidism, serum TSH is higher than the Laboratory reference ranges when free T3 and T4 are in the normal values.[4] The prevalence of patients' detection in subclinical thyroid diseases is very low. Therefore, an accurate diagnosis measurement criteria is needed for best treatment and disease control. Most of the studies focused on liver enzyme profile such as Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), and Alkaline Phosphatase (ALP), Gamma-glutamyl Transpeptidase (GGT) activity for correlation of thyroid disease.[3.5] Other studies studied the cardiac profile such as serum Creatine PhosphoKinase (CPK) and Lactate Dehydrogenase (LDH) to determine its activities in thyroid disorders.[6]

MATERIALS AND METHODS

Study Design: This was a descriptive cross sectional study.

Study area

The study was conducted in ALribat University Hospital which is located in Khartoum state.

Study population

This study included 185 individuals with both gender divided as follow.

60 had hyperthyroidism (29 males and 31 females), 60 had hypothyroidism (25 males and 35 females) and 65 apparently healthy individuals as control group. Mean age 20±65 years in all groups.All patients were selected through direct questionnaire from the ALribat university hospital Khartoum, the study period spanned from (July 2016 to march 2017).

Inclusion Criteria

Individuals without any chronic condition other than thyroid disorders were included in this study.

Exclusion Criteria

Individuals with an active or recent infection including liver disease, bone and muscle disease, cardiac, pancreatic, hepatobillary, diabetes, hypertension, malignancy, pregnancy, alcoholics, and drug abusers were excluded.

Sample collection

Blood samples were collected from all patients in plain containers. Blood samples were centrifuged for 5 minutes at 1500 rpm, and the serum was separated in new containers and tested.

Ethical considerations

All participants who included in this study were informed in a clear way about the aim and principle of this research. The study was approved by the research committee of medical laboratory science, Sudan International University.

Statistical Analysis

Data was analyzed by computer programmed statistical package for the social science (SPSS) software program version (15.0) One-way Anova test and independent T. test were conducted

to show differences between cases and control while person's correlation was used to find the association between variables, P.value of ≤ 0.05 was considered significant.

METHODS

Estimation of (AST, ALT, ALP, GGT, CPK and LDH) was done by MINDRAY (BS-380) machine and its reagents depending on kinetic methods; while data of thyroid hormone were collected (analysis was done by COBAS (e 411) machine).

RESULTS

The statistical analysis was done by SPSS (One-way Anova test, independent T, test and person's correlation), results were as follow.

AST, GGT, CPK and LDH level in all groups showed a significant increase level when compared to control group. (Table 1 and 2).

ALT and ALP level in all groups showed an insignificant differencelevel when compared tocontrol group. (Table 1 and 2).

CPK, GGT and ALT activity level in male: showed insignificant difference when compared with female and AST, ALP and LDH activity levelin male showed insignificant difference when compared with female among hyperthyroidism group (Table 3)

ALP activity level in male: showed significant increased when compared with female andAST, ALT, GGT, CPK and LDH activity levelin male showed insignificant difference when compared with female among hypothyroidism group (Table 4).

Results showed significant positive correlation between activity level of GGT, CPK and T3, TSH, while there was insignificant difference between activity level of AST, LDH, GGT, ALT and thyroid hormone, duration of disorders among hyperthyroidism groups (Table 5).

Results showed significant positive correlation between age of AST, ALT, CPK and T3, TSH, while there was insignificant difference between age of ALP, LDH, GGT and thyroid hormone among hyperthyroidism groups (Table 5).

Results showed significant positive correlation between activity level of ALT, AST, ALP, CPK, LDH and T3, TSH, duration of disorders, while there was insignificant difference

between activity level of AST, ALT,ALP, GGT, CPK and thyroid hormone, duration of disorders among hypothyroidism groups (Table 6).

Results showed significant positive correlation between age of AST, ALT, CPK, LDH and T3, TSH, while there was insignificant difference between age of ALP, GGT and thyroid hormone among hypothyroidism groups (Table 6).

Table 1: Comparison of means activity of liver enzymes (AST, ALT, ALP, and GGT), total CPK and LDH between Hyperthyroidism and Control.

Variables	AST M±SD	ALT M±SD	ALP M±SD	GGT M±SD	CPK M±SD	LDH M±SD
Hyperthyroidism (60)	29±1.3	15 ± 6	120±51	33 ± 30	95±64	245±231
Control (65)	18±4.9	17.6±5.9	111±34	23.7±7.5	69±22	136±30
P. Value	0.000	0. 1	0. 2	0. 01	0. 02	0. 000

One-way Anova test was used

P.V considered significant ≤0.05

Table 2: Comparison of means activity of liver enzymes (AST, ALT, ALP, and GGT), total CPK and LDH between Hypothyroidism and Control.

Variables	AST M±SD	ALT M±SD	ALP M±SD	GGT M±SD	CPK M±SD	LDH M±SD
Hypothyroidism (60)	33±18	16.9±12.6	120±54	26 ± 16	95±64	267±30
Control (65)	18±49	17.6±5.9	111±34	23.7±7.5	69±22	136±30
P. Value	0.000	0. 6	0. 2	0. 4	0.006	0. 000

One-way Anova test was used

P.V considered significant ≤0.05

Table 3: Comparison of means activity of liver enzymes (AST, ALT, ALP, and GGT), total CPK and LDH between Male and female hyperthyroidism.

Variables	AST M±SD	ALT M±SD	ALP M±SD	GGT M±SD	CPK M±SD	LDH M±SD
Male(29)	30.7±12	14.8 ± 6	131±61	30.6±15	75 ± 36	278±325
Female(31)	27.9±13	15.8 ± 6	110±0.1	35 ± 39	114±78	214±62
P.Value	0. 4	0. 5	0. 1	0. 4	0. 01	0. 2

Independent test was used

P.V considered significant ≤0.05

Table 4: Comparison of means activity of liver enzymes (AST, ALT, ALP, and GGT), total CPK and LDH between Male and female hypothyroidism.

Variables	AST M±SD	ALT M±SD	ALP M±SD	GGT M±SD	CPK M±SD	LDH M±SD
Male (25)	31.4±14	14.1±4	118.4±67	25.7±11	101.4±106	235.4±111
Female (35)	34.4±20	18.8±15	90.7±41	26.8±19	101.9±81	276.9±150
P.Value	0.5	0.1	0.07	0.7	0.9	0.4

Independent test was used

P.V considered significant ≤0.05

Table 5: Correlation between T3, T4, TSH, duration of disorder and age, activity liver enzymes (AST, ALT, ALP and GGT), total CPK and LDH of Hyperthyroidism.

	T 3		T 4		TSH		Duration		Age	
Variables	R	P.V	R	P.V	R	P.V	R	P.V	R	P.V
AST	0.33	0.09	-0.085	0.5	-0.240	0.6	0.008	0.9	0.16	0.2
ALT	-0.026	0.8	-0.021	0.8	0.163	0.2	0.160	0.2	0.28	0.03
ALP	-0.049	0.7	-0.147	0.2	-0.157	0.2	-0.097	0.4	-0.09	0.4
GGT	0.27	0.03	0.002	0.9	-0.198	0.1	-0.009	0.9	-0.22	0.09
CPK	-0.28	0.03	-0.085	0.5	0.272	0.03	0.270	0.03	0.4	0.001
LDH	0.061	0.44	-0.034	0.7	0.031	0.8	0.135	0.3	-0.02	0.8

Pearson correlation was used

Correlation considered significant when P.V ≤0.05

Table 6: Correlation between T3, T4, and TSH, duration of disorder and age, activity of liver enzymes (AST, ALT, ALP and GGT), total CPK and LDH of Hypothyroidism.

	T 3		T 4		TSH		Duration		Age	
Variables	R	P.V	R	P.V	R	P.V	R	P.V	R	P.V
AST	-0.182	0.16	-0.237	0.06	0.152	0.2	0.250	0.05	0.5	0.00
ALT	0.071	0.5	0.260	0.04	-0.292	0.02	0.019	0.8	0.23	0.07
ALP	0.160	0.2	0.422	0.00	-0.297	0.02	0.090	0.4	-0.04	0.7
GGT	0.087	0.5	0.144	0.2	-0.107	0.4	0.013	0.9	-0.14	0.2
CPK	-0.233	0.07	-0.278	0.03	0.197	0.13	0.260	0.04	0.5	0.00
LDH	-0.263	0.04	-0.358	0.00	0.323	0.01	0.300	0.01	0.52	0.00

Person correlation was used

Correlation considered significant when P.V ≤0.05

Table 7: Correlation between T3, T4, TSH, and liver enzymes (AST, ALT, ALP and GGT), total CPK and LDH of Control.

	T 3		T 4		TSH	
Variables	R	P.V	R	P.V	R	P.V
AST	0.22	0.06	0.27	0.03	0.25	0.04
ALT	0.34	0.00	0.46	0.00	0.03	0.80

ALP	0.23	0.06	0.37	0.00	0.09	0.40
GGT	-0.14	0.20	-0.04	0.70	0.31	0.01
CPK	-0.17	0.10	-0.10	0.40	0.11	0.30
LDH	-0.14	0.20	-0.00	0.98	0.19	0.10

Person correlation was used

Correlation conceder significant when P.V ≤0.05

DISCUSSION

In this study 60 hyperthyroidism patients, 60 hypothyroidism patients and 65 healthy individuals age matching were included in the study. The serum level of AST, GGT, CPK and LDH were significantly increased in hyperthyroidism patients when compared with healthy individuals (P. Value: AST 0.000, GGT 0.000, CPK 0.001 and LDH 0.02). This finding agreed with study done by Pandey and Biondi, B., (P. value less than 0.05).[3.7] There were insignificant differences in the levels of ALT and ALP when compared with healthy individuals (P.Value: ALT 0.1 and ALP 0.2) respectively, this was disagreed with a study done by Sudanese researchers Ibrahim MO, who reported significance difference in ALT and ALP (P. Value: 0.00 and 0.04).[8]

In hypothyroidism patients the level of AST, CPK and LDH was significantly increased when compared with healthy individuals (P.Value: 0.000, 0.02 and 0.000) this finding agreed with a study done by Mc Growder, D.A. and Bhagwat (P.Value: CPK 0.001 and LDH 0.01)[9.10] and disagreed with study done by Pandey (P.Value: less than 0.05)the level of GGT, ALP and ALT show insignificant difference.[3]

Results showed significant positive correlation between activity level of GGT, CPK and T3, TSH, while there was insignificant difference between activity level of AST, LDH, GGT, ALT and thyroid hormone, duration of disorders among hyperthyroidism groups.

Results showed significant positive correlation between activity level of ALT, AST, ALP, CPK, LDH and T3, TSH, duration of disorders, while there was insignificant difference between activity level of AST, ALT, ALP, GGT, CPK and thyroid hormone, duration of disorders among hypothyroidism groups.

Results showed significant positive correlation between age of AST, ALT, CPK and T3, TSH, while there was insignificant difference between age of ALP, LDH, GGT and thyroid hormone among hyperthyroidism groups.

Results showed significant positive correlation between age of AST, ALT, CPK, LDH and T3, TSH, while there was insignificant difference between age of ALP, GGT and thyroid hormone among hypothyroidism groups.

CONCLUSION

In hyperthyroidism AST, GGT, LDH, CPK were significantly increased when compared with healthy individuals and no significant difference in ALT and ALP level. In hypothyroidism patients the levels of AST, CPK and LDH were significantly increased when compared with healthy individuals however GGT, ALP and ALT showed insignificant difference. There wasa correlation between thyroid hormones, age, duration of disorders and liver, cardiac enzymes in hyperthyroidism and hypothyroidism.

REFRENCES

1. Targher, G., et al., Association between serums TSH, free T4 and serum liver enzyme activities in a large cohort of unselected outpatients. Clin Endocrinal (Oxf), 2008; 68(3): 481-4.
2. Bahn Chair, R.S., et al., Hyperthyroidism and other causes of thyrotoxicosis: management guidelines of the American Thyroid Association and American Association of Clinical Endocrinologists. Thyroid, 2011; 21(6): 593-646.
3. Pandey, R., et al., Assessment of Serum Enzymes Level in Patients with Thyroid Alteration Attending Manipal Teaching Hospital, Pokhara. A Journal of Life Sciences, 2013; 3(1): 1-9.
4. Surks, M.I., et al., Subclinical thyroid disease: scientific review and guidelines for diagnosis and management. Jama, 2004; 291(2): 228-38.
5. Azizi, F., gamma-Glutamyl transpeptidase levels in thyroid disease. Arch Intern Med, 1982; 142(1): 79-81.
6. Ranka, R. and R. Mathur, Serum creatine phosphokinase in thyroid disorders. Indian J Clin Biochem, 2003; 18(1): 107-10.
7. Biondi, B., et al., Subclinical hyperthyroidism: clinical features and treatment options. Eur J Endocrinal, 2005; 152(1): 1-9.
8. Ibrahim, M.O., S.A. Ahmed and O.F. Idris, Assessment of Liver Enzymes Levels among Sudanese Hyperthyroidism Patients. British Journal of Medical and Health Research, 2016; 3(3).

9. Mane, A.Y. and V.R. Bhagwat, Serum enzymes and liver function tests in thyroid disorders. Biomedicine, 2011; 31(4): 517- 522.
10. Mc Growder, D. A., et al., Serum creatine kinase and lactate dehydrogenase activities in patients with thyroid disorders. Niger J Clin Pract, 2011; 14(4): 454-9.