BJMHR
British Journal of Medical and Health Research
Journal home page: www.bjmhr.com

Assessment of Liver Enzymes Levels among Sudanese Hyperthyroidism Patients

Mona Osman Ibrahim [1], Suhair A. Ahmed[1*], Omer Fadl Idris [2]
1.Department of Clinical Chemistry, Faculty of Medical Laboratory Science, University AL Neelain University.
2.Department of Biochemistry and Molecular Biology, Faculty of Science and Technology, AL Neelain University.

ABSTRACT

Thyroid hormones regulate the metabolisms of all cells including hepatocytes, and hence, modulate hepatic function .Thyroid disorders often accompany abnormal serum enzyme levels and disturbances in liver functions, this study aim to assess relationship between serum enzymes and liver functions in thyroid disorders. 40 cases of hyperthyroidism and 40 controls were induced in this study by convenience sampling. Their liver enzyme profile for aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphatase (ALP) were determined and analyzed for correlation. Three variables were measured for all cases and controls, plasma level activity of liver specific enzymes ALT, AST and ALP. The mean values between cases and controls showed a significant increase in ALP and ALT and no significant difference was shown in AST. Also a correlation was found between age, gender and ALP among cases while no correlation was found in AST and ALT.

Keywords: Hyperthyroidism, liver enzymes AST, ALT, ALP, Sudan.

*Corresponding Author Email: suhir4@yahoo.com
Received 27 February 2016, Accepted 03March 2016

Please cite this article as: Ahmed SA *et al*., Assessment of Liver Enzymes Levels among Sudanese Hyperthyroidism Patients. British Journal of Medical and Health Research 2016.

INTRODUCTION

Hyperthyroidism is one of the most common endocrine disorders characterized by increased secretion of thyroid hormones T3 and T4.[1] When associated with diffuse goiter and ocular signs it is known as Grave's disease. It accounts for 60–80% of all the thyrotoxic cases with the highest incidence in women between the ages of 20–40 years due to unknown etiology. Grave's disease is almost always an autoimmune disease demonstrated with specific immunoglobulins in the plasma of these patients. These immunoglobulins are autoantibodies known as long acting thyroid stimulators (LATS), having a potent and prolonged effect as compared to thyroid stimulating hormone[2,3.] Thyroid hormones are essential for normal growth, development and function of all tissues of the body by regulating BMR of all cells, including hepatocytes. The liver in turn metabolites thyroid hormones and regulates their systemic endocrine effects. Therefore thyroid dysfunction may disturb liver functions and liver diseases modulate thyroid hormones metabolism.[4] Thyrotoxicosis is associated with a variety of abnormalities of liver function. The pathogenesis of hepatic dysfunction in thyrotoxicosis is unknown, but has been attributed to mitochondrial dysfunction and hepatic tissue hypoxia. Increases in AST and ALT after starting anti-thyroid treatment for Grave's disease is not due to the side effects of anti-thyroid drug but may be induced by changes in thyroid function.[5] Liver has a key role in thyroid hormones metabolism and their serum level is very important for normal hepatic function and bilirubin metabolism. Besides the associations between thyroid and liver diseases of an autoimmune nature, such as primary biliary cirrhosis and thyrotoxicosis, thyroid diseases are frequently associated with liver injuries and biochemical test abnormalities, i.e., elevation of ALT, AST, and ALP these thyroids liver associations may cause diagnostic confusions and neglect of these facts may result in over or under diagnosis of associated liver or thyroid diseases. Therefore it is suggested to measure free T4 and TSH level to rule out coexistent possibility of thyroid dysfunction in any patient with unexplained liver biochemical test abnormalities [6]. However, the cause and effect relationship between the two is now becoming clear.[7,8] Liver enzymes profile had been proved valuable diagnostic and prognostic guideline both in clinical practice and occupational medicine; reflecting the status, size, structure and functions of liver affected by age, sex, environmental factors, various diseases and drugs , It is well known that liver biochemical abnormalities have been shown in untreated patients with hyperthyroidism.[9, 10] Hyperthyroidism can affect multiple organ system, including the cardiovascular, nervous, gastrointestinal, and hepatic systems. The interaction between the thyroid and liver is critical for maintaining homeostasis in both sites. Thyroid hormones are glucuronidated and sulfated within the liver and subsequently excreted into bile; addition, these hormones maintain the

metabolism of bilirubin by playing a role in the enzymatic activity of glucuronyltransferase and by regulating the level of ligandin, a major organic anion-binding protein. [11] Therefore, it is not surprising that hepatic dysfunction is commonly observed in patients with thyroid disease. In 1874, Habershon described a patient with exophthalmic goiter, heart disease, and jaundice who died.[12] Many subsequent case reports and series have highlighted the prevalence of liver test abnormalities (ranging from 15% to 76%) in the setting of hyperthyroidism. [13, 14]

Malik and Hodgson reviewing the relationship between thyroid gland and liver they mentioned that thyroid hormones T3 and T4 are essential for the growth, development and function of all organs of the body. Serum AST is also elevated in cardiac and muscle disorders as the enzyme is rich in myocardium and skeletal muscles. It increases in acute myocardial infarction, muscular, dystrophies and myositis. However no increases are reported in muscular disease of nervous origin. [15] It is possible that mild elevation of serum transaminases could be an effect of anti-thyroid drug therapy. It is reported that elevation of AST, and ALP occurs in about 30% of the patients on propylthiouracil.[16] Carbimazole and methimazote may induce elevation of serum bilirubin, ALP and garnma-glutamyl transpeptidase within 2-3 weeks. On initiation of treatment and can persist for several months despite discontinuation of the drug.[17] High ALP levels in hyperthyroidism may be attributed to the hyperactivity of thyroid hormones rather than abnormal liver functions. Since ALP is also distributed predominantly in bone tissue. The changes in ALP levels in thyroid disorders are not due to altered liver function. Since other LFTs such as serum TB, TP, AIT is not much different from the euthyroid controls. This confirms that the changes in ALP are not due to abnormality in liver function. It is more likely due to altered bone metabolism. Also it is known that musculoskeletal disorders are common in thyroid diseases. [18]

MATERIALS AND METHOD

Study design:

Descriptive cross sectional study involved 40 patients with both gender. All patients were selected through direct questionnaire from the Radiation and isotopes center Khartoum (Rick), the study period spanned from (December 2015to February 2016). The aim of the study was to assess relationship between serum enzymes and liver functions in hyperthyroidism patients.

Patients and Method:

Blood samples were collected from all patients in plane containers. After verbal consent from all participants. Blood samples were centrifuged for 10 minutes at 3000-4000 rpm, and the

serum was separated in new containers and well-kept, stored at -20co till tested for AST, ALT and ALP levels. Mindray BA-88A was used for determination of serum enzymes in Alfarapay Private Laboratory in Khartoum city.

Inclusion criteria:

Patients diagnosed with hyperthyroidisms were included in this study.

Exclusion criteria:

Patients who had complications such as cardiovascular disease, hypertension and diabetes mellitus were excluded from the study. The patients who have the history of liver disease and using any of drugs effecting liver and patients with positive hepatic viral markers were excluded from the study.

Ethical consideration: This study was approved by faculty of medical laboratory sciences, Al Neelain University, Khartoum, Sudan, and ethical clearance was obtained from ministry of health Sudan. All participants (patients and control group) signed an informed consent before samples collection.

Statistical Analysis:

Statistical analysis was performed using SPSS data were expressed as mean and standard deviation (M±SD), the means were compared using independent T. test and Pearson's correlation analysis was used for correlation of parameters measured, P-value < 0.05 was considered as statistically significant.

RESULTS AND DISCUSSION

This study involved 40 patients with hyperthyroidism (10 males and 30 females) their ages ranged between 20-75 years. Blood samples were collected from patients to assess serum level of AST, ALT and ALP, this level was compared with similar healthy control group. The means of plasma AST, ALT and ALP levels among patients were 26.6, 24.8, 155.4, respectively and among control group were24.7, 17.1 and 92.0 respectively shown in (Table 1). Although there was increased liver enzymes (AST, ALT and ALP) among patients when compared to control group.

In this study mean serum ALT p.value (0.00) and ALP p.value (0.004) were significantly higher when compared with control groups but in AST insignificance was found.

The study showed the Pearson correlation and P. value for plasma levels AST (.026,872) ALT(.031,848) were not correlated with age but ALP(_448,004) was positively correlated (Table2).

Pearson correlation of gender of hyperthyroidism patients and liver enzymes found to be significant with ALP (p. value 0.000) and not significant with AST (p.value.140)ALT (p.value.218) (Table 3).

Table 1: Describe the comparison between the level of enzyme in hyperthyroidism patients and control group

Enzyme	Control mean ± SD	Patients mean ± SD	P.Value
AST	24.7± 6.8	26.6±8.4	0.229
ALT	17.1±8.9	24.8±9.2	0.00
ALP	92.0±33.6	155.4±132.4	0.004

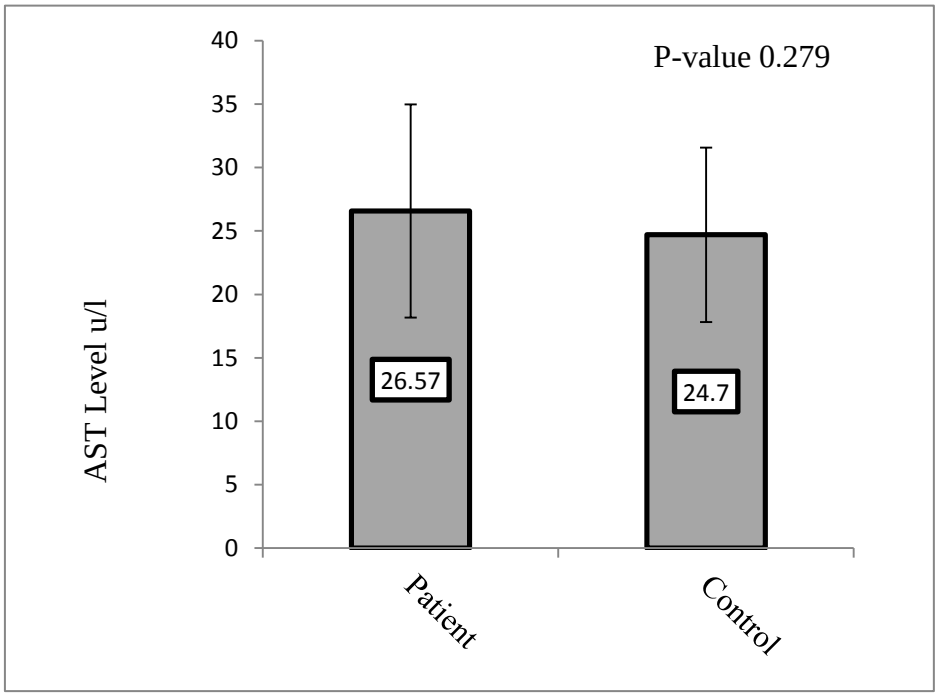

Figure 1: Comparison between the level of AST in hyperthyroidism patients with control group.

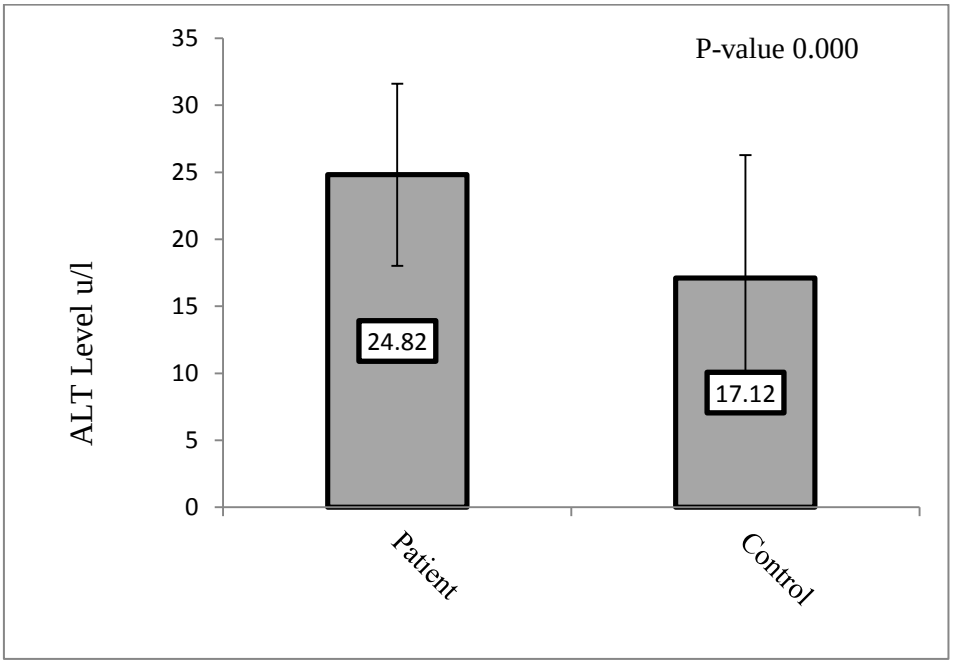

Figure 2: Comparison between the levels of ALT in hyperthyroidism patients with control group.

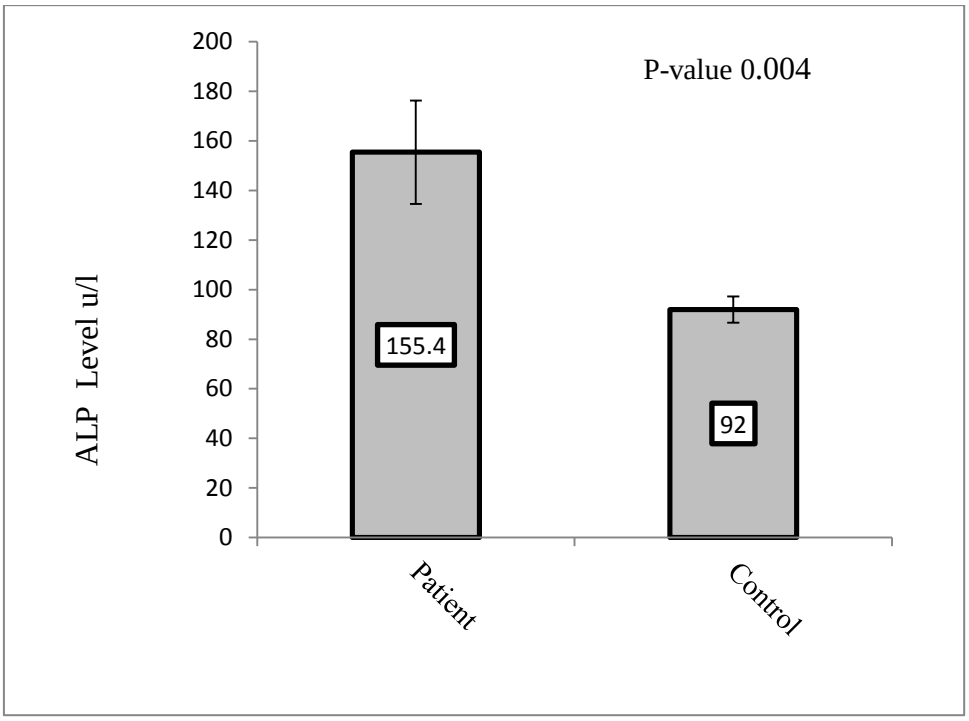

Figure 3: Comparison between the levels of ALP in hyperthyroidism patients with control group.

Table 2: Pearson correlation coefficient among Age and liver enzymes

Enzymes	Pearson Correlation	P.Value
AST	026	872
ALT	031	848
ALP	448**	004

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3: Pearson correlation coefficient among Gender and liver enzymes

Enzymes	Pearson Correlation	P.Value
AST	140	0.389
ALT	218	0.176
ALP	631**	0.000

** Correlation is significant at the 0.01 level (2-tailed).

The current case-control hospital based study estimated the mean values of AST, ALT, and ALP in patients, and control group. The mean values of the plasma liver enzymes activity AST,ALT and ALP in hyperthyroidism group were slightly higher than that of control group but statistically ALT ,ALP significant and AST insignificant (table1).These findings of increase of AST,ALT and ALP agreed with findings of the previous research who had found such result outcomes among their patients. [19,20] and our results agreed about anti-thyroid drugs (ATD) .[5] Our results findings in this study revealed positive correlation between the age , gender and increased ALP levels (p.value 0.004,0.000).

CONCLUSION

Plasma levels of liver enzyme ALT, ALP were significantly elevated when compared with controls but not significant with AST. A significant correlation was found between the age, gender and plasma enzyme ALP but no significance was found with transaminases AST and ALT.

RECOMMENDATIONS

The elevated plasma level of the liver specific enzymes in humans can be used as a diagnostic tool for predicting the presence of clinically significant hepatic changes in patients with thyrotoxicosis. Furthermore simple, reliable, specific and noninvasive techniques can be easily performed in central and peripheral hospitals for the study of prognosis of thyrotoxicosis

REFERENCES

1. Cooper, D.S. Hyperthyroidism. Lancet 2003;362:459–68.
2. Weetam, A.P, McGregor, A.M. Autoimmune thyroid disease developments in our understanding. Endocr, Rev. 1984;5:309–55.
3. Botazzo, GF, Doniach D. Autoimmune thyroid disease. Annu Rev Med 1986;37:353–9.
4. Malik, R, Hodgson H. The relationship between the thyroid gland and the liver. QJM 2002; 95:559–69.
5. Kubota, S, Amino N, Matsumoto Y, Ikeda N, Morita S, Kudo T, et al. Serial changes in liver function tests in patients with thyrotoxicosis induced by Grave's disease and painless thyroiditis. Thyroid 2008; 18:283–7.
6. Huang, M.J, Liaw YF. Clinical associations between thyroid and liver diseases. J Gastroenterol Hepatol 1995; 10:344–50.
7. Huang, IVfl, LiawYF. Clinical association between thyroid and liver diseases. J Gastroenterol Hepatol 1995;10:344-350..
8. Mehta, P.J. Serum enzyme in primary hypothyroidism. Ind J Pathol Microbiol 1982; 25(2):1 13- 1 1 6.
9. Biscoveanu, M, Helsinki S. Abnormal results of liver function tests in patients with Grave's disease. Endocr Pract 2000;6(5):367–9
10. Bayraktar, M, Van Thiel DH. Abnormalities in measures of liver function and injury in thyroid disorders. Hepatogastroenterology 1997;44:1614–8.
11. Fagiuoli, S, Van Thiel DH. The liver in endocrine disorders. In: Rustgi VK, Van ,Thiel DH, eds. The Liver in Systemic Disease. New York, New York: Raven Press; 1993:285-287.

12. Habershon, S.O. Exophthalmic goiter, heart disease, jaundice: death. *Lancet.* 1874;1:510-512.

13. Fong, T.L, McHutchison J.G, Reynolds T.B. Hyperthyroidism and hepatic dysfunction. A case series analysis. J Clin Gastroenterol. 1992; 14:240-244.
14. Huang M.J, L.i ,K.L, Wei JS, Wu ,S.S, Fan, K.D, Liaw, Y.F. Sequential liver and bone biochemical changes in hyperthyroidism: prospective controlled follow-up study. Am J Gastroenterol. 1994;89:1071-1076.
15. Pearce, J.M.S, Pennington, R.I, Walton J.N. Serum enzyme studies in muscle diseases Part-II; Serum Creatine kinase activity in muscular dystrophy and in other myopathic and neuropathic disorders. J Neuro Neurosurg Psychiat 1964; 27: 96-99.
16. Kim, H.J, Kim, B.H, Han, Y.S, Yang, I, Kim K.J, Dong S.H, et al. The incidence and clinical characteristics of symptomatic polythiouracil-induced hepatic injury in patients with hyperthyroidism: a single center retrospective study. Am J Gastroenterol 200I; 96:165-9.
17. Woeber, K.A. Methimazole-induced hepatotoxicity. Endocr Pract 2002;8(3): 222-224.
18. Cakir, M, Samnci, N, Balci N, Balci MK. Musculoskeletal manifestations in patients with thyroid disease. Am Heart Hosp J 2005;3($: 227 -233.
19. A.Y. Mane and V.R. Bhagwat, Serum enzymes and liver function tests in thyroid disorder, 517_522.
20. Tariq, M.K, Correlation between plasma thyroid hormones and liver enzymes level in Thyrotoxic cases and controls in Hazara division, J Ayub Med Coll Abbottabad 2010;22(2), 176_179.