EVALUATION OF SERUM LIPID PROFILE AMONG HYPERTHYROID PATIENTS IN AMINU KANO TEACHING HOSPITAL, KANO

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ABSTRACT

Background: Hyperthyroidism is the condition that reflects excessive concentrations of thyroid hormones in the body that is the thyroid gland is overactive. Hyperthyroidism is thus a cause of thyrotoxicosis, the clinical condition of increased thyroid hormone in the blood (Cleve 2009).

Aim: The aim of this study was to evaluate serum lipid profile among hyperthyroid patients in Aminu Kano Teaching Hospital

Methodology: A total of 62 subjects were used for this study 31 hyperthyroid patients and 31

Control subjects. The blood samples were centrifuged, serum collected and analyzed spectrophotometrically using enzymatic reaction for {total cholesterol, triglycerides and HDL] while LDL was determined by freidwalds formula.

Results: The results show that serum TC, HDL-C, LDLC-C and TG levels were significantly lower in patients than in controls. There were negative and significant correlation between T_3 and TC, T_3 and TG, TSH and TG in patients ($r=\sim0.292$ $p<0.05$, $r=-0.529$ $p<0.001$ and $r-0.487$ $p<0.001$ respectively), while there was positive and significant correlation between serum T_4 and LDL-C in controls ($r=0.426$, $p<0.05$).

Conclusion: It can be concluded that serum lipids were significantly reduced in hyperthyroid patients.

Keywords: Hyperthyroidism, Lipid profile, hormones, Serum, Thyroid

INTRODUCTION

Hyperthyroidism is the condition that reflects excessive concentrations of thyroid hormones in the body that is the thyroid gland is overactive. Hyperthyroidism is thus a cause of thyrotoxicosis, the clinical condition of increased thyroid hormone in the blood (Cleve 2003). Located in the front of the neck, the thyroid gland produces the hormones thyroxin (T_4) and triiodothyronine (T_3) which regulates the body's metabolic rate by forming ribonucleic acid (RJNA) and increasing oxygen absorption in every cell. In turn, the production of these hormones is controlled by the pituitary gland .When production of the thyroid hormones increased despite the level of thyroid-stimulating hormones (TSH) being produced, hyperthyroidism occurs (Cleve 2003).

Hyperthyroidism causes a decrease in the production of cholesterol; a condition known as hypocholesterolemia. It disturbs the transport of lipoproteins in the body: The decrease in cholesterol and low-density lipoproteins, leads to the possible onset of hyperthyroidism can lead to heart attack or stroke. The high cholesterol levels in the bloodstream can cause the accumulation of plaque, which can hinder normal blood flow. If this blockage affects blood flow to the heart, a heart attack may occur. If the blockage affects blood flow to the brain, a stroke may occur.

Thyroid hormones are essential for the regulation of important processes involved in thermogenesis, energy consumption and many other metabolic processes. Decreased body weight, increased thermogenesis are characteristic features in majority of hyperthyroid patients, lipids increases thermogenesis and regulate body weight (Cleve 2003.)

Lipids commonly known as fats, are heterogonous group of organic substances which are insoluble in water and are soluble in a group of organic solvents. The common fat solvents include chloroform, benzene. Ether and light petroleum. Lipid comprises a large number of diverse chemical substances. The major lipids in human plasma include cholesterol, triglyceride, phospholipids', sphingolipids and non esterifies fatty acid (NEFA). Laboratory methods are generally available to analyze the above mentioned lipids (Ochei *et al.*, 2005)

Cholesterol is a lipid present in cell membrane and the most abundant steroid in human tissues and fluid cholesterol is necessary for the manufacture of bile and for the synthesis of vitamin D and various blood steroid hormones. It is a significant component of the cell membrane.

Triglycerides are fatty acid esters of glycerol that contain three different fatty acids. The concentration of triglycerides rises after a fatty meal and remains increased for several hours. (Ochei *et al.*, 2005)

Triglycerides are used in the body mainly to provide energy for different metabolic processes.. The high cholesterol levels in the bloodstream can cause the accumulation of plaque, which can hinder normal blood flow. If this blockageaffects blood flow to the heart, a heart attack may occur. If the blockage affectsblood flow to the heart, a heart attack may occur. If the blockage affects blood flow to the brain, a stroke may occur (Matsubara *et al.*, 2000). Thyroid hormones are essential for the regulation of important processes involved in thermogenesis, energy consumption and many other metabolic processes. Decreased body weight, increased thermogenesis are characteristic features in majority of hyperthyroid patients, lipids increases thermogenesis and regulate body weight. The objectives of the study was to estimate lipid profile among hyperthyroid patients and compare the results with the control (Matsubara *et al.,* 2000).

MATERIALS AND METHODS

A total of 62 subjects were recruited. These consisted of 31 hyperthymic! patients and thirty (31) apparently healthy subjects (controls)..About 5ml of blood was collected from the subjects using standard technique and carefully transferred into clean specimen bottle. The blood was allowed to clot at room temperature and then centrifuged at 3000 rpm for 5 minute the sera were carefully separated from the red cells using Pasteur pipette into a sample (bijor) bottle, and analyzed for thyroid hormones and lipids. Hettich universal centrifuge D32 (Germany) was used for the spinning of the samples. Beckman coulter Du/520 general purpose (ul/visible) spectrophotometer, (Germany) was used for the measurement of serum thyroid hormones.

Inclusion and exclusion criteria

Patients who are diagnosed to have hyperthyroidism are included in this study. Apparently healthy individuals who are non-hyperthyroid,non-diabetic patients are included in the study as controls. Patients who are diabetic are excluded from the study and all subjects who decline to give consent were excluded from the study.

Statistical analysis

The data obtained was analyzed statistically using Microsoft Excel Software. Serum lipid concentrations obtained from hyperthyroid patient was compared with those of the apparently healthy individuals using students t- test.

Correlations of age with each of serum cholesterol, triglycerides, HDL and LDL were carried out using Pearson's linear correlation analysis. A P-value of equal to or less than 0.05(P<0.05) was considered as statistically significant.

RESULTS

The results for thyroid hormones and serum lipids were presented in the following tables. Table 1 shows the results of thyroid function tests in patients and controls.

These results shows that serum T_3 and T_4 concentrations were significantly higher in patients (p<.00I) than in controls, while serum TSH concentrations were significantly lower (p<0.00l) in patients than in controls.

Table 2 shows the result of serum lipids in patients and controls. There results shows that serum TC,LDL-C and TG were significantly lower (p<0.001, p<0.02 and p<0.001respectively) in patients than in controls, while serum concentrations of HDL-C inpatients and controls were not statistically significant (p<0.05) correlation between serum thyroid hormones and lipids in patients and controls were presented in Tables 3 and 4 respectively.

Table 4.3 shows the relationship between serum thyroid hormones and lipid in hyperthyroid patients. The results in this table shows that there were negative and significant correlations between T_3 and TC r=-0.292,p<0.05, T_3 and TG r=~G.529, p<0.001, TSH and TG r=-G.487, p<0.001respectively, while there were no significant correlations between T_3 and T_3 and HDL-C, T_3 LDL-C, T_4 and TC and T_4 and LDL-C, $T_4$and TG, TSH and TC, TSH and HDL-C and TSH and LDL-C.

Table 4.4 shows the relationship between serum thyroid hormones and lipids in controls. These results shows that there were no significant correlation between most of the serum thyroid hormones and lipids except that there was positive and significant correlation between serum T_4 and LDL-C (r=G.426, p<0.05)

Table 1: Serum **thyroid** hormones concentrations (mean±SEM) among hyperthyroid patients

Subjects	**n**	**T_3 (mol/L)**	**T_4 (mol/L)**	**TSH** (mol/L)
"Patients	31	7.59±0.43	342.51±55.29 0	44±0l5
Control	31	2.49±4.49	101.27±4.49	2.42±0.19
p-vaiue		<0.001	<0.001	<0.001

SEM=standard Error of n=sample size, T_3=triodothyronine, X_4 Thyroxin, TSH=Thyroid Stimulating Hormone, nmol/L= nanomole per liter

Table 2: **Serum lipid concentration (mean**±SEM) **among hyperthyroid patients and controls**

Subject	**n**	**TC (mmo/L)**	**HDL-C(mmol/L)**	**LDL-C *(mmol/***	***V* TG(mmol/L)**
Patients	31	3.37±0.14	L04±0.03	1.13±0.07	0.91±0.40
Control	31	4.19±0.11	1.12±0.07	1.92±0.16	1.44±0J1
p-value		<0,001	<0.005	<0.02	<0.001

n=sample size, TC=Total Cholesterol, HDL=High Density Lipoprotein $_5$LDL=Low Density Lipoprotein, TG=Triglyceride, SEM=Standard Error of Mean, mmol/L=milli mole per liter

Table 3: Relationship between serum thyroid hormones and lipid in hyperthyroid patients

Serum thyroid hormones	Serum Lipids (mmol/L)			
(nmol/L)	**TC**	**HDL-C**	**LDL-C**	**TG**
T_3	r=-0.292	r=-0.09	r=-0.123	r=-0.529
	p<0.05	p>0.05	p>0.05	P>0.001
T4	r=-0.299	r=-0.308	r=-0.357	r=-0.115
	p>0.05	p>0.05	p>0.05	p>0.05
TSH	r=-0.251	r=-0.139	r=-0.081	r=-0.487
	p>0.05	p>0.05	p>0.05	p<0.001

T3=Triiodothyronine, T4=Thyroxine, TSH=Thyroid Stimulating Hormone, TC=Total Cholesterol, HDL=High Density Lipoprotein, LDL=Low Density Lipoprotein, TG=Triglyceride P>0.05=statistically not significant P<0.05=statistically significant, mmol/l=Milli mole liter.

Table 4: Relationship between serum thyroid hormones and lipids in controls.

Serum thyroid hormones (nmol/L)	Serum lipids (mmol/L) TC	HDL-C	LDL-C	TG
T_3	r=0.157	r=0.061	r=0.148	r=-0.074
	p>0.05	p>0.05	p>0.05	p<0.05
T_4	r=~0.122	r=0.213	r=0.426	r-0.213
	p>0.05	p>0.05	p<0.05	p>0.05
TSH	r=-0.226	r=0.003	r=213	r=-.005
	p>0.05	p>0.05	p>0.05	p>0.05

T_3=Triiodothyronine, T_4=Thyroxine, TSH-Thyroid Stimulating Hormone, TC=Total Cholesterol, HDL-High Density Lipoprotein, LDL-Low Density lipoprotein, TG=Triglyceride, P<0.05=Statistically significant, P>0.05=Statistically not significant.

DISCUSSION

Evaluation of serum lipid profile among hyperthyroid patents was carried in the Department of Chemical Pathology of Aminu Kano Teaching Hospital, Kano using 31 hyperthyroid patients and 31 controls subjects. The findings of this study demonstrate that serum thyroid hormones concentrations were deranged in hyperthyroid patients with marked increase in T_3 and T_4 levels and marked decreased in TSH level as excepted. The results of lipid profile evaluated in the presence study shows that lipids concentrations were markedly reduced in TC and TG concentrations. These therefore demonstrate that there is deranged lipid metabolism in hyperthyroid patients.

Leonhardt *et al* (2008), Ozata *et al (*2008) and Mantzoros et al (2007) have also found that there is abnormal lipid metabolism in hyperthyroid patients. However there is disagreement between the pattern of the result of the present study and those found by the authors mentioned. In this case, this previous study reported that there is study which demonstrates low lipid levels in these patients. The presence study shows that there was negative significant correlation between thyroid hormones and lipids in hyperthyroid patients this therefore demonstrate that as the thyroid hormones levels increases serum lipid concentration decreases.

The finding of low serum lipids concentrations in the presence study could be due to either to decrease lipid synthesis, increase lipid catabolism or increased rate of clearance from circulation caused by excess thyroid hormones concentration in the body.

This could be supported by the report of Burns et al (2005) who observed that in hyperthyroid patients there are increase fatty acids hydrolysis and uncoupling of energy production from fat stores.

The derangement of serum lipids as observed in the presence and previous study could be due to interaction between thyroid hormone receptors and adipose tissue. (Ebar *et al* 2005) reported the TSH-receptors have been identified in adipose tissue and thus the possibility to it regulating lipid. These authors also stated that T_3 induced alteration in adipocytes sensitivity to catecholamine can give rise to altered serum lipid concentration in hyperthyroid patients.

CONCLUSION

It can be concluded from the observation in this study that:

Serum activities of T_3 and T_4 were significantly higher inpatients than in controls while TSH levels were significantly lower in patients than in controls. Also Serum lipids concentrations were significantly reduced in hyperthyroid patients. Finally there was also a negative and significant correlation between serum thyroid hormones and lipids in hyperthyroid patients.

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