THYROID DYSFUNCTION;
SERUM LIPID PROFILE IN SUDANESE PATIENT

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ABSTRACT... Objectives: Studies on relation between serum lipids and thyroid dysfunction are numerous but, on the whole, desultory and inconclusive. The aim of this study was to investigate the concentration of serum triglyceride, cholesterol and cholesterol profile in Sudanese patient with thyroid dysfunction. **Design:** A case control study. **Period:** April 2008 to June 2009. **Setting:** Khartoum, Omdurman and Ibrahim Malik teaching Hospital, Khartoum State. **Material and Methods:** 200 Sudanese patients with thyroid dysfunction (hypothyroidism 100, hyperthyroidism 100) was compared with 100 healthy subjects as control group . Serum samples was taken and cholesterol, triglyceride, LDL and HDL levels were analyzed using colorimetric methods. **Results:** The mean ±SD serum triglyceride, total cholesterol, HDL and LDL in normal case respectively were 63.3±8.5, 163±6, mg/dl 44.3±3.7 mg/dl, 78.8±8 mg/dl. Among hypothyroidism, the mean ±SD serum total cholesterol, LDL, HDL respectively were 213.9±31.8 mg/dl, 38.5±3.5 mg/dl, 123.8±27.4 mg/dl and also among hyperthyroidism the mean ±SD serum triglyceride, total cholesterol, HDL and LDL respectively were 55.2±6.1mg/dl,152±11.5 mg/dl, 40.7±1.3 mg/dl and 76.1±9.7 mg/dl. Serum level of triglyceride, total cholesterol, and LDL is significantly elevated in hypothyroidism patients when compared with their control group ($P<0.05$). these changes in lipids profile among hypothyrodism patients are reversed upon thyroxine (T4) replacement therapy($p < 0.05$). **Conclusions:** This study conclude that, the hypothyroidism causes significant increases of serum triglyceride, total Cholestrol, and LDL, with slight decreases in HDL level. In contrast thyroid replacement therapy reversed these changes.

Key words: Triglyceride, total cholesterol, HDL, LDL, thyroid dysfunction, Sudanese

INTRODUCTION

Thyroid hormones have profound metabolic effects, the most striking action being an increase in energy expenditure. In hyper-thyroidism the metabolic effects include increased utilization and oxidation of all major fuel substrates, that is, protein, glucose and lipids[1,2]. Hyperthyroidism is characterized by increased lipolysis in femoral and abdominal adipose tissue and increased lipids[1,2]. The metabolic effects of hypothyroidism are not well characterized. The condition is characterized by increased fasting plasma cholesterol and triglycerids[3,4]. Although the lipid abnormalities associated with hypothyroidism have described[5,6] and the beneficial effect of treatment of hypothyroidism on lipid abnormalities has been reported[6]. The effects of hypothyroidism on HDL cholesterol level have been contradictory. HDL cholesterol levels have been reported to be increased[7], decreased[8] and normal[9] in hypo-thyroidism. Likewise, few studies have addressed the effect of treatment of hypothyroidism on apolipoprotein: it is less commonly appreciated in lipoprotein physiology which tend to be the opposite to those seen with hypothyroidism[10]. It is well-known that hypothyroidism is associated with hyper cholesterolemia and increases the risk of atheroscherosis disease[11,5]. There is general agreement that total and LDL-C and triglyceride level increase in hypothyroid.

Hyperlipidemia observed in hypothyroidism, is a metabolic result currently treatable with thyroid hormone. Before the availability of sensitive thyroid hormone analysis increased serum or plasma cholesterol level accepted as important evidence supporting the diagnosis of hypothyroidism[12]. But classical signs and symptoms of clinical hypothyroidism may not be observed where it is mild or moderate[13]. The aim of this study, is to investigate the concentration level of triglyceride, cholesterol and cholesterol profile in Sudanese patients with thyroid dysfunction (hypo and hyperthyroidism).

MATERIAL AND METHODS

Reagents

All chemical reagents were purchased from Biosystem Company (Spine Company for Analytical Material and Chemical Reagents).

Subject and study population

The case – control study included Sudanese patients

attending the Khartoum, Omdurman and Ibrahim Malik Teaching Hospital in Khartoum State, in period from April 2008 to June 2009. Hundred subjects were used as baseline control age range from 15- 72 years. Baseline value was formulated by considering those patients (age-matched) who presented with hypothyroidism. In this study infected person with age in hypothyroidism from 14-72, hyperthyroidism from 16-72 years.

In this study the patients with thyroid dysfunction and under treatment with thyroid drugs. The excluding criteria is based on patients with any other disease.

Blood sample: were collected from case and control, 5ml blood from each individual of study population. The blood was centrifuged at 5000 r.p.m for 10 minutes and serum was obtained. Serum sample obtained was subjected to colorimetric methods. Serum T_3 and T_4 were measured by microplate competitive enzyme immunoassay and TSH measured by microplate immunoenzymateric assay (Monobind, Costa Mesa, USA)[14,15].

STATISTICAL ANALYSIS

The data was analyzed by computer program (SPSS). Student t-test was used for the calculation. $P \leqslant 0.05$ was considered significant.

RESULTS

The questionnaire of this study includes age, sex, occupation, treatment and duration of the disease. The mean ±SD serum triglyceride, total cholesterol, HDL and LDL in normal case respectively were 63.3±8.5, 163±6, mg/dl 44.3±3.7 mg/dl, 78.8±8 mg/dl. Among hypothyroidism, the mean ±SD serum triglyceride, total cholesterol, LDL, HDL respectively were 157.3± 9.6 mg/dl, 213.9±11.8 mg/dl, 38.5±3.5 mg/dl, 123.8± 7.4 mg/dl and also among hyperthyroidism the mean ±SD serum triglyceride, total cholesterol, LDL and HDL respectively were 55.2±6.1 mg/dl, 152.0±11.5 mg/dl, 76.1±9.7,and 40.7±1.3 mg/dl mg/dl (in table II).

Difference in serum levels of triglyceride, total cholesterol, and LDL between hypothyroidism patients and their control group was significant (P<0.05) in table II. In contrast there is no significant different in serum lipid profile between hyperthyroidism patients and their control group($p \geqslant 0.05$) table II.

Table-I. Demographic data of the patients (200) and the normal control group

Parameters	Thyroid dysfunction		Control n=100
	Hypo-thyroidism	Hyper-thyroidism	
Age	14-72 years	16.72	15-72
No. of subjects	100	100	100
Duration of the disease	1-22 years	4 months to 10 year	-

Table-II. The mean of serum triglyceride, cholesterol and cholesterol profile and fT_3, fT_4, TSH of patients and control group.

Parameters	Thyroid dysfunction		Control n=100
	Hypo-thyroidism	Hyper-thyroidism	
Total cholesterol mg/dl	213.9±11.8*	152.0±11.5	163.0±6.0
TG mg/dl	157.3±9.6*	55.2±6.1	63.3±8.5
HDL mg/dl	38.5±3.5	40.7±1.3	44.3±3.7
LDL mg/dl	123.8±7.4*	76.1±9.7	78.8±8.0
fT_3 pmol/l	2.0±0.6*	5.5±1.3	2.4±1.2
fT_4 pmol/l	4.4±2.3*	159.5±12.3	6.7±1.5
TSH mU/l	85±5.3*	1.2±0.3	1.55±1.4

**There is a significant difference between serum triglyceride, cholesterol, HDL and LDL in hypothyroidism patients with their control case ($P \leq 0.05$).*

Demographic data results for the study subjects were presented in table (I). After treatment of hypothyroidism patients with levothyroxine, for 6 weeks later,fT_4, fT_3, had significantly increased where as TSH had fallen significantly. The estimated triglyceride, cholesterol and LDL were significantly reduced (157.3± 9.6 versus 91.0 ± 6.2 mg/dl , 213.9±11.8 versus 184.3 ± 7.8 mg/dl , 123.8 ±7.4 versus 94.5 ± 6.4 mg/dl respectively, $p \leqslant 0.05$) as

Table-III. Comparison of TSH, T_4, T_3, triglyceride, cholesterol, LDL and HDL in hypothyroidism patients pre and post treatment with levothyroxine for six weeks.

Parameters	Pretreatment	Post-treatment	Mean difference	p-value
Triglyceride mg/dl	157.3±9.6	91.0±6.2	55	0.000
Cholesterol mg/dl	213.9±11.8	184.3±7.8	29.6	0.001
LDL mg/dl	123.8±7.4	94.5±6.4	29.3	0.001
HDL mg/dl	38.5±3.5	42.3±2.4	3.8	0.87
TSH mU/l	85±5.3	1.8±0.2	83.2	0.000
fT_4 pmol/l	4.4±2.3	6.4±1.4	2.0	0.01
fT_3 pmol/l	2.0±0.6	3.5±1.2	1.5	0.01

shown in table-III.

DISCUSSION

These results suggest that the effect of hypothyroidism on lipid metabolism is more marked in patients with higher serum. TSH levels (table II). Even mild elevations of TSH are associated with changes in lipid profile significant enough to raise the cardiovascular risk[16]. The higher prevalence of hypothyroidism among middle aged women, associated with an increase in total plasma cholesterol[17]. This is in agreement with our finding showing that hyperlipidemia is associated with hypothyroidism. Hypothyroidism result in a small in 1000 density lipoprotein (LDL-c), total serum cholesterol and decrease in high density lipoprotein (HDL-c) that enhance the risk for development of Aflero Scherosis and coronary artery disease, there is no clear evidence to date that hypothyroidism causes clinical heart disease[18]. Hypothyroidism increases the oxidation of plasma cholesterol mainly because of (i) an altered pattern of binding and (ii) due to the increased levels of cholesterol, which presents substrate for oxidative stress. Hypothyroidism is often accompanied by diastolic hypertension that, in conjunction with the dyslipidemia, may promote atherosclerosis. However, thyroxide therapy, in a thyrotropin (TSH) suppressive dose, usually leads to a considerable improvement of the lipid profile[19]. The increased incidence of coronary artery disease in subjects with hypothyroidism may due in part to the lipid abnormalities found in this condition. These lipid abnormalities and the response to treatment of hypothyroidism have previously been described[5,6]. The effects of hypothyroidism on apolipo-protein concentration is, however, less well known, furthermore, it is less commonly appreciated that hyperthyroidism is also associated with disturbance of lipoprotein physiology. This study confirm the increased total cholesterol found in hypothyroidism[10] which has been reported by others. These changes revert towards normal with treatment of the underlying thyroid abnormality. In contrast to the well known effects on total cholesterol, the effect of thyroid dysfunction on HDL cholesterol levels reported in the literature has produced conflicting results[7,8,9]. In the present study we found a definite decrease in HDL cholesterol levels after treatment of hypothyroidism and the opposite after treatment of hyperthyroidism. These changes are consistent with a recent therapy study[20].

CONCLUSIONS

This study demonstrated that, the hypothyroidism is the risk factor for atherosclerosis and CAD . In contrast thyroid replacement therapy has beneficial effects on the serum lipid profile and on the risk of CAD in patients with hypothyroidism

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