

Derangement in Lipid profile & renal function in hypothyroid Iraqi patient.

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Abstract

Background: thyroid dysfunction is often related with the disturbed mineral metabolism and dyslipidemia. Kidney dysfunction in the hypothyroidism appears to be related to thyroid hormone levels decrease rather than thyroid autoimmunity.

Aim of study: investigate the deterioration in renal function test & lipid profile in Iraqi patients with primary hypothyroidism.

Subjects & methods: 143 patients with primary hypothyroidism with 155 healthy subjects as control group were selected. The measurements of thyroid stimulating hormone (TSH), free thyroxine (FT 4), and free tri-iodothyronine (FT 3), were achieved. Triglyceride, serum total cholesterol, LDL-cholesterol, HDL-cholesterol, blood urea, glucose, serum creatinine with serum calcium & phosphorus were measured for both patients & controls.

Results: this study showed significant increase in blood urea, serum creatinine, cholesterol, triglyceride and LDL-cholesterol in patients compared with control group, while serum calcium and HDL-cholesterol were significantly decline in patients in comparison with controls.

Conclusion: hypothyroidism may be an under-appreciated reason for renal impairment and dyslipidemia.

Keywords: hypothyroidism, renal impairment, dyslipidemia.

Introduction

Typical thyroid functions play an important roles in activity of cell division regulation, rate of basal metabolism, and general body metabolic system ⁽¹⁾ Therefore, dysfunction of thyroid is often related with the disturbed mineral metabolism and dyslipidemia. Hypothyroidism is causing hypercholesterolemia, high LDL (low-density lipoprotein), and hypertriglyceridemia. ⁽²⁾ It has been recorded that high circulating levels of TSH (thyroid stimulating hormone) have been related with abnormally raised serum lipid, ⁽³⁾ and led to increase oxidation of particles of LDL. ⁽⁴⁾ Also, raised cardiovascular risks in dysfunction of thyroid were associated with endothelial dysfunction, the deranged

lipid profile, hemodynamic, metabolic, and hormonal changes and disturbances of the coagulation. ⁽⁵⁾ That's why, the hypothyroid patient is considered to be at high risks of cardio-vascular diseases. ⁽⁶⁾

The renal blood stream will be lessened in hypothyroidism by diminished cardiac output, expanded peripheral vascular resistance,⁽⁷⁾ intrarenal vasoconstriction,⁽⁸⁾ diminished renal response to vasodilators,⁽⁹⁾ Also a lessened outflow from decrease expression of renal vasodilators e.g., VEGF (vascular endothelial Growth element), insulin like Growth factor-1 (IGF-1).⁽¹⁰⁾ Pathologic progressions in the glomerular structure in hypothyroid patients, for example, thickening in glomerular basement membrane and mesangial matrix

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expansion, might additionally help decreased renal blood flow. ⁽¹¹⁾ The primary hypothyroidism maybe related with reversible rises of serum creatinine. ⁽¹²⁾ This expansion may be watched to more than half (55%) for adults with hypothyroidism. ⁽¹³⁾

Kidney dysfunction in hypothyroidism appears to be related to levels of thyroid hormone decrease rather than the thyroid auto-immunity. ⁽¹⁴⁾ The mechanisms included in hypothyroidism-related kidney derangements are due to direct impacts of TSH with indirect impacts of endocrine and paracrine mediators, e.g., insulin-like growth factor 1 (IGF-1), Furthermore vascular endothelial growth factor. ⁽¹⁵⁾

The aims of this research are:

Determine the deterioration in renal function test with the disturbance in lipid profile test in Iraqi patients with primary hypothyroidism.

Patients and methods

This is a case- control study was carried out on the patients who selected with primary hypothyroidism who visited the outpatient clinic of Endocrinology and Oncology center in Baghdad Teaching Hospital, University of Baghdad in a period between December

2017 and May 2018. Inclusion criteria involved all females and males aged 35-55 years, with primary hypothyroidism. Exclusion criteria involved the patient by chronic kidney disease, abnormal liver functions, diabetes mellitus or cardiac diseases. However, the number of patients selected were 143 (M=81, F=62). The patient had an average age of 39±6.5 years (range 35-55years); their mean body mass indexes (BMI) were 27.5± 5.2 kg/ m²,

In addition to 155 healthy subjects (M= 79, F= 76) who visited the hospital for routine medical checkup have been reported and employed as control group who matched for age and BMI with that of the patients. The measurement of FT3 (free tri-iodothyronine), FT4 (free thyroxine), and TSH (thyroid stimulating hormone) have been achieved by the Autoanalyzer (Cobas E411, ELeCsys 2010, Mannheim, Germany). Other bio-chemical experiments: triglyceride, serum total cholesterol, LDL-cholesterol, HDL-cholesterol, blood urea, glucose, serum creatinine with serum calcium and phosphate were achieved using Dimension RxL-Max, Germany.

The results have been expressed as numbers, mean ± SEM (standard error of mean). Significance of difference was assessed using t- test between two variables, taking P ≤ 0.05 lowest limit of significance. ⁽¹⁶⁾

Results

Table 1. clinical characteristics and thyroid function test among hypothyroid patients & controls.

Studied parameters	Patients Mean± SEM No=143	Controls Mean± SEM No= 155	P-value
Age (years)	39± 6.5	38.5± 5.5	0.31NS
BMI (kg/m ²)	27.5 ± 5.2	29 ± 6.5	0.09NS
TSH (mIU/L) N.V.(0.4-6.4)	18.5 ± 5.11	3.39 ± 1.08	0.03*
Free T3(nmol/L) N.V. (4.0-8.3)	2.4 ± 0.23	4.5± 1.54	0.004*
Free T4(nmol/L) N.R (10.0- 20.0)	6.1± 0.89	13.23±0.11	0.001*

* : significant

NS: non-significant

Table 2. laboratory results of renal function test, minerals& FBG among patients with hypothyroidism & controls.

Studied parameters	Patients Mean± SEM No= 143	Controls Mean± SEM No=155	P-value
Blood urea (mg/dl)	59 ± 3.9	35.1 ± 1.08	0.01*
Serum creatinine (mg/dl)	2.04 ± 0.02	0.95 ± 0.01	0.02*
Serum calcium (mg/dl)	8.46 ± 1.47	10.21 ±1.07	0.02*
Serum phosphate (mg/dl)	3.3± 0.25	4.2± 0.7	0.14 NS
Fasting glucose (mg/dl)	123.62± 21.3	96.25 ±10.5	0.51 NS

* : significant

NS: non-significant

Table 3. lipid profile test among patients with hypothyroidism & controls.

Studied parameters	Patients Mean± SEM No= 143	Controls Mean± SEM No=155	P-value
Total-cholesterol (mg/dl)	245 ± 31.2	191.2 ± 12.11	0.005*
Triglyceride (mg/dl)	185 ± 12.6	172 ± 9.96	0.08 NS
LDL-cholesterol (mg/dl)	132 ± 6.35	99.7 ± 8.05	0.001*
HDL-cholesterol (mg/dl)	39.12 ± 4.56	58.66 ± 2.55	0.001*

* : significant

NS: non-significant

Discussion

This study tried to investigate the changes in mineral metabolic and lipid process in the patient with thyroid hypofunction. Many studies reported the association between hypothyroidism and renal shutdown in adults. Some authors showed extreme impairment of kidney functions in the hypothyroid patient.⁽¹⁷⁾ Previous studies of an experimental animal, have demonstrated that amiodarone-induced hypothyroidism in the rodent might have been related with the decline of renal functions, which might have been reversible upon amiodarone-withdrawal.⁽¹⁸⁾ It might have been also accounted for that hypothyroidism might magnify those officially impaired renal function, which might reversed by amiodarone- withdrawal.⁽¹⁹⁾ Those pathophysiology for impeded renal functions in hypothyroidism are multi-factorial; the decrease in GFR because of low cardiac output in addition, renal blood flow will be likely to be a predominant mechanism. Also, it recommended that thyroxine might contribute in tubular secretion of creatinine, however, hypothyroidism might increases releasing creatinine from muscles.⁽²⁰⁾

Interestingly, there might have been a slight rise in fasting glucose for hypothyroid patients. Some researchers shown that hypo- and hyperthyroidism are related with resistance of insulin, which accounted for real reason for impeded glucose metabolism in diabetes mellitus type 2 related with dysfunction of thyroid. The most prominent mechanism underlying that etiology for diabetes in the thyroid disorder might have been proposed with hereditary genetic predisposition with reduce glucose utilization by the muscle, overproduction of hepatic glucose, in addition to enhance absorption of splanchnic glucose.⁽²¹⁾ These reports illustrate those impeded tolerance of glucose in hyperthyroid patients and the slight increase in glucose levels in the hypothyroid patient. Also, the recent study demonstrated a significant rise in the serum cholesterol with increased level of LDL-cholesterol and triglyceride in the hypothyroid group. This might have been for compatibility for the effects accounted by a few investigators.⁽²⁾ Thyroid hormones would refer to control the level of the plasma cholesterol by increase of the LDL-receptors expression, improving the LDL-cholesterol cellular uptake.⁽²²⁾ This might have been suggested to convey out by the T3-assisted gene activation achieved using direct bindings of T 3 with the particular thyroid hormone responsive component.⁽²³⁾ Also, T 3 had been indicated will make include in ensuring LDL particles from oxidation.⁽²⁴⁾ Thyroid hormones would know with expansion that lipoprotein-lipase efficacy, the enzyme responsive for the clearance of VLDL and the chylomicron from the plasma.⁽²⁵⁾ Therefore, for hypothyroidism, the freedom about IDL (intermediate density lipoprotein) and chylomicron remnant might have been postponed from the plasma.⁽²⁶⁾ These lipoproteins remnant are consumed eventually from the macrophage in blood vessels for producing cells of foam which are the first process in atherosclerosis.

The present data likewise showed a decrease in the HDL-cholesterol in the group of hypothyroid. Those particles of HDL are referred to have various atheroprotective functions, involving protection of LDL from oxidation, assistance of the reverse cholesterol transport,

improvement in endothelial function, and reduce hemostasis.⁽²⁷⁾ Those diminishment of HDL-cholesterol causing the increasing in the ratio of LDL/HDL, which will be a prognostic marker to the cardiovascular disorder. In addition the presented datum showed that serum TG was non-significantly elevated in the hypothyroid group. Also, this agrees other researchers who demonstrated increment of serum triglycerides in overt and sub-clinical hypothyroidism, the mechanism underlying this might have been recommended to make that hypothyroidism increment the rate of hepatic VLDL-TG secretion in comparison to normal subjects.⁽²⁸⁾

The presented outcomes revealed diminishment in levels of serum calcium and serum phosphate in hypothyroid patients in which the alteration of serum calcium can considered as a risk of cardiovascular disorder.⁽²⁹⁾ These discoveries were comparative of the results obtained from other researchers who found that the mean of levels of serum phosphorus and calcium have been significantly lowered in the hypothyroid in comparison to the controls.⁽³⁰⁾ The previous investigations exploring serum calcium and phosphate in the thyroid dysfunction have conflicting outcomes. Some researchers have demonstrated normal levels, this discussion in discoveries demonstrates that multifaceted nature of the hormonal and cell division components included in the regulation of phosphate and calcium metabolic systems within renal tubular and intestinal levels, which might be disturb in the thyroid illness.⁽³¹⁾

In conclusion: hypothyroidism may be an under-appreciated reason for renal impairment. Hypothyroidism brought about impeded renal capacity and glucose intolerance. Moreover, hypothyroidism might have been connected with hypertriglyceridemia hypercholesterolemia, with the raised LDL, and diminished HDL. Hypothyroidism might have been connected with diminishment serum calcium with phosphate level.

It is proposed that medical practitioners think as of requesting tests of the thyroid function in diagnosing etiology of dyslipidemia, glucose intolerance, serum mineral disturbances, and unexplained deterioration of renal functions.

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