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ORIGINAL ARTICLE

Disorders of Thyroid Hormones and Lipids in Patients with Type 2 Diabetes in Baghdad City

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ABSTRACT
The aim of the current study was to evaluate thyroid hormone levels and the lipid profile among patients with type-2 diabetes. Venous blood samples were taken from (75) individuals, (50) patients (20 males and 30 females) and (25) healthy individuals as a control group for comparison of results. Serum thyroid hormones and serum lipid profile were estimated for the study groups. The results revealed that S. triglyceride, S. VLDL, S. LDL, S. cholesterol, fasting blood sugar (FBS) levels were significantly elevated (208,83±26.67) mg/dl, (116,19±23,85) mg/dl, (34,79±6,69) mg/dl, (159,22±32,29) mg/dl and (165±14,98) respectively when compared with their levels in the controls, while there was a decrease in serum high density lipoproteins (HDL) levels among patients with type-2 diabetes compared to the controls. A significant decrease was also shown in thyroid hormone levels (T3 & T4) in sera of patients with type-2 diabetes in comparison with their levels in the controls, whereas significant increase was detected in serum TSH hormone levels among type-2 diabetics in comparison with its level in the healthy control group. The study also revealed that (54%) of diabetic patients were affected by thyroid hormone diseases, while (46%) of them were not affected with thyroid disorders. Out of those (54%) type 2 diabetic patients (36%) were females, while (18%) were males. In conclusion, our study showed that there was an obvious effect of thyroid hormone and lipid profile levels on patients with type 2 diabetes.
Keywords: Diabetes mellitus**,** Triglyceride**,** Thyroid hormones, High density lipoproteins**.**

INTRODUCTION
In the year 1979, the relationship between thyroid dysfunctions and Diabetes mellitus has been first published [1]. The dysfunction of thyroid glands is exhibited either as hypo or hyperthyroidism and expressed in the level of the thyroid stimulating hormone (TSH) [2]. The most common endocrine disease is Diabetes mellitus, which is the main cause of death throughout the world [3]. It is estimated by the WHO that the prevalence rate of diabetes recorded (2.8%) in 2000 and (4.4%) in 2030. The number of patients with diabetes is supposed to increase from 171 millions in 2000 to 366 millions in 2030 [4].

Thyroid diseases are the commonest endocrine disease following diabetes among the general populations [5]. Following the year 1979, several studies estimated prevalence rate of thyroid dysfunctions among diabetic individuals to range between (2.2-17%) [6,7,8]. Nevertheless, fewer studies reported higher thyroid-diabetes prevalence i.e. (31%) and (46.5%) respectively [6,7]. It acts on regulating the production of hepatic glucose, as well as dyslipidemia including impaired fatty acid homeostasis, lipoprotein and triglyceride [8].

Diabetes and thyroid diseases were shown to affect each other, and correlation between them have long been reported. An elevated thyroid dysfunction frequency of progressing ages has been observed, with a highly prevalent thyroid disorders among females in comparison with males, also in people with diabetes compared to non-diabetics [9]. Perros et al revealed 13.4% prevalence rate in thyroid disorders in diabetic people, with a highly incidence among type 1 diabetic women (31.4%) with lowest incidence in T2-DM men (6.9%) [10]. Thyroid diseases were most common among patients suffering from type-1 diabetes in comparison with type-2 diabetics, owing to the related autoimmunity. The biochemical-physiological interrelationship between autoimmune thyroid disorders and type-2 diabetes has nowadays become an interesting field of studies [11].

Diabetes mellitus is shown to affect thyroid functions in 2 sites; 1st at the level of hypothalamus controlling of TSH decretion and 2nd at peripheral tissues via conversion of T4 into T3. Hyperglycaemia causes decrease in hepatic concentrations of T4-5 deiodinase, reduced concentrations of serum T3, increased reverse T3 level with decreased, normal or increased T4 levels. Thyroid hormones regulate metabolism, and DM may change metabolic processes [12]. Our study aimed to assess prevalence of thyroid dysfunctions among type 2 diabetics and show the effect of type-2 DM on some biochemical markers.

METHODS
In the present study, venous blood samples were obtained from (100) persons, (75) of them had type 2 diabetes (45 females and 30 males), and (25) healthy non-diabetic individuals from the Teaching Laboratories at the Medical city, Baghdad/Iraq during a period from Jan. to April 2019. The following tests were performed on the blood samples:

1 Lipid profile which included serum cholesterol, triglyceride, LDL,HDL and VLDL.
2 Fasting blood sugar (FBS)
3 Thyroid hormones which included T3, T4 and TSH, which were measured using the Chemilluminoassay.

Statistical analysis: Analysis of data in this study were done using SPSS-20 program. Means and standard deviations of all variables have been also calculated.

RESULTS
Our cross-sectional study have been performed on (50) type 2 diabetic patients (20 males and 30 females), and (25) healthy individuals as a control group for comparison of results.

Results of table (1) demonstrated that there were significant increase in levels of S. triglyceride, S. VLDL, S. LDL, S. cholesterol, fasting blood sugar (FBS) (208,83±26.67) mg/dl, (116,19±23,85) mg/dl, (34,79±6,69)mg/dl, (159,22±32,29) mg/dl and (165±14,98) respectively when compared with their levels in the controls, while it was shown that there was a decrease in serum high density lipoproteins (HDL) levels among type-2 diabetes patients when compared to controls.

Table 1: Mean and SD± of lipids and FBS in the study group (type 2 DM patients and controls)

Parameters	Diabetic patient M±SD	Non-diabetic M±SD	P-Value
Serum cholesterol	208.83±26.67	171.98±7.93	<0.0001
S. Triglyceride	159.22±32.29	129.32±12.19	<0.001
HDL	41.9±4.98	42.5±3.48	<0.0184
LDL	116.19±23.85	98.87±9.02	<0.001
VLDL	34.79±6.69	26.93±2.99	<0.001
F.B.S	165±14.98	84.96±6.46	<0.001

HDL: High density lipoprotein, LDL: Low density lipoprotein VLDL: Very low density lipoprotein, F.B.S:-Fasting blood sugar.

The results also showed significant decreases in thyroid hormone (T3) and (T4) (123.9±43,12) and (6,19±2.99) ng/dl levels respectively in the sera of type 2 diabetes patients in comparison with their levels among controls, whereas significant increase was

found in serum TSH hormone level among type-2 diabetics in comparison with its level in the healthy controls as seen in table (2).

Table 2: Mean and SD± of thyroid hormone among the study group (type-2 DM patient with controls)

Parameters	Diabetic patient M±SD	Non-diabetic M±SD	P-Value
Serum T_3 (ng\dl)	123.9±43.12	149.9±13.09	<0.001
Serum T_4 (ng\dl)	6.19±2.99	7.89±0.87	<0.0011
Serum TSH(µU\ml)	7.59±6.83	3.49±1.10	<0.0011

T_3:-Free triiodothyronine, T_4:-Free thyroxin, TSH:-Thyroid stimulating hormone.

The study also revealed that among type-2 diabetics, (54%) were affected by thyroid hormone diseases, while (46%) of them were not affected with thyroid disorders. Out of those (54%) type 2 diabetic patients (36%) were females, while (18%) were males as illustrated in the table (3).

Table 3: Distributions of diabetic patients with thyroid disorders according to gender

Diabetic patient (gender)	Thyroid disorder	%
Male (20)	7	18%
Female (30)	12	36%
		54%

DISCUSSION

In the current study, type 2 diabetic individuals showed highly significant serum triglycerides, cholesterol, VLDL and LDL levels with low HDL levels when compared with the healthy non diabetic controls. These findings were consistent with an earlier study performed on young adults by [13] who showed an increased prevalence of dyslipidemia was a main contributing factor of C.V.D in diabetic patients. Abnormal elevated concentrations of S. lipids among diabetics is mainly because of the high free fatty acids mobilizations from peripheral fatty depot [13,14]. Insulin resistance plays essential roles in type-2 DM as it results in increased free fatty acid release from fatty tissues [15,16], leading the activation of signaling enzyme proteins kinase-C, phosphatidylenositol-3 (PI-3) kinase inhibitions with increased production of reactive-oxygen species. There will be an immediate production of mechanism of nitric oxide impairing or a decrease in its bioavailability [17].

When they reach the sub endothelial spaces, the monocytes will start internalization of the oxidized LDL cholesterol through scavenger receptor and become foam cells leading to fatty streak formation, the sign of an early atherosclerotic lesion [18].This study detected high abnormal thyroid hormone level prevalence among people with type-2 diabetes. Our observations agreed with the studies by [19,20,21] who found in their studies different alterations in thyroid hormone levels among DM patients.

The levels of abnormal thyroid hormone could be a result of different drugs administered by diabetic individuals, e.g. insulin, the anabolic hormone that promotes T4 levels, but suppresses T3 levels via hepatic conversion inhibition of T4 to T3.

CONCLUSIONS

It can be concluded from this study that thyroid hormone and lipid profile levels are affected in type 2 diabetics.

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