Clinical Medicine Journal
Vol. 4, No. 2, 2018, pp. 6-14
http://www.aiscience.org/journal/cmj
ISSN: 2381-7631 (Print); ISSN: 2381-764X (Online)

Correlation Between Hypothyroidism, Hyperthyroidism, and Lipid Profile in Thyroid Dysfunction Patients

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Abstract

Background: It well is known that thyroid hormones are involved in regulation of lipid and lipoprotein metabolism; therefore, thyroid dysfunctions induce a significant change in lipid levels. Thyroid hormones are an important modulator of intermediary metabolism. Objectives: This study was conducted to observe the correlation between hypothyroidism, hyperthyroidism and lipid profile in thyroid dysfunction patients. Methods: The study group consists of 118 subjects of both sex (53 males & 65 females) between the age 20-87. The samples of these patients were collected from Asian Institute of Medical Science at Faridabad region. The subjects were divided into four groups the first group consisting 51 subjects for hypothyroidism which also divided into two subgroups 14 patients suffering from overt hypothyroidism and 37 patients suffer from sub-clinical hypothyroidism, second group for normal conditions or control which consist 20 subjects, third group consisting 14 patients suffering from hyperthyroidism, and last group consist 33 patient suffer cardiac disease. About 3 ml blood samples were collected to detect FT3, FT4, TSH, cholesterol, triglyceride, HDL-C, LDL-C, and VLDL–C analyzed in the lab of Asian Institute of Medical Science in Faridabad region. Results: The present study demonstrated multiple biochemical abnormalities in the serum lipids in hypothyroidism and hyperthyroidism subjects, there is an increase in the most lipid profile in both hypothyroid and hyperthyroid patients, and finally, dyslipidemia which is one of the major risk factors of atherosclerosis and coronary disease. There is an increase in total cholesterol, VLDL-C, and levels and decreased in HDL-C in hypothyroidism patients. And there is also increase in total and LDL cholesterol, and decreased in HDL-C level in hyperthyroidism patients, within no changes in VLDL and levels, and there is no significant between hypothyroidism and hyperthyroidism groups). Conclusion: This study concluded that there is an increase in the most lipid profile in both hypothyroid and hyperthyroid patients and finally dyslipidemia which is one of the major risk factors for atherosclerosis and coronary disease. There is an increase in total cholesterol, VLDL-C, and levels and decreased in HDL-C in hypothyroidism patients. And there is also increase in total and LDL cholesterol, and decreased in HDL-C level in hyperthyroidism patients.

Keywords

Correlation, Thyroid Dysfunction, Hypothyroidism, Hyperthyroidism, Lipid Profile, Dyslipidemia

Received: May 12, 2018 / Accepted: June 15, 2018 / Published online: July 23, 2018

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1. Introduction

The thyroid gland is a butterfly-shaped endocrine gland that is normally located in the lower front of the neck. The thyroid's job is to make thyroid hormone [1]. The thyroid gland is important in the human body because of its ability to produce the hormones triiodothyronine (T3) and tetraiodothyronine (T4), necessaries for appropriate energy levels, and an active life. It has long been known that thyroid hormones are of vital importance in maintaining the initial level of phospholipids in cell membranes and fatty acids composition of the lipids [2]. Thyroid hormone is a potent stimulator of metabolism, playing a critical role in regulating energy expenditure and in key physiological mechanisms, such as growth and development [3]. It influence all major metabolic pathways. Their most obvious and well-known action is an increase in basal energy expenditure obtained acting on protein, carbohydrate, and lipid-metabolism. With specific regard to lipid metabolism, thyroid hormones affect synthesis, mobilization, and degradation of lipids, although degradation is induced more than synthesis. The main and best-known effects on lipid metabolism include: (a) enhanced utilization of lipid substrates; (b) increase in the synthesis and mobilization of stored in adipose tissue; (c) increase in the concentration of non esteroid fatty acids (NEFA); and (d) increase of lipoprotein-lipase activity [4].

Endocrine diseases are increasing globally but are growing more rapidly in Asia [5]. Diseases of the thyroid gland are amongst the most abundant endocrine disorder in the world second only to diabetes mellitus [6]. Thyroid diseases are primarily conditions that affect the amount of thyroid hormones being produced. Excess production leads to hyperthyroidism while diminished production leads to hypothyroidism [7]. The thyroid gland is prone to several very distinct problems, some of which are extremely common. Production of too little thyroid hormone causes hypothyroidism or production of too much thyroid hormone causes hyperthyroidism [8].

Hypothyroidism is one of the most commonly occurring thyroid disorders worldwide [9]. It is defined as a deficiency of thyroid activity. It results from reduced secretion of both T4 and T3 [10]. Hypothyroidism is relatively common and is associated with an unfavourable effect on lipid metabolism [11]. Hypothyroidism, characterized by low serum thyroid hormone levels, is associated with reduced metabolism, reduced lipolysis, weight gain, reduced cholesterol clearance, and elevated serum cholesterol. It is known that thyroid hormone has genomic and non genomic effects [12]. Biochemically decrease in T4 and T3 concentrations lead to hypersecretion of pituitary TSH and an amplified increase in serum TSH levels. This is a key laboratory finding, particularly in the early detection of thyroid failure [13]. Alteration in lipid profile is a common observation in patients with thyroid dysfunction [14]. Hypercholesterolemia is favored due to the hormone deficit and to the decreased activity of the lipoprotein lipase [13]. In hypothyroid patients the most frequent lipid abnormality is hypercholesterolemia, mainly due to an increased concentration of low density lipoproteins (LDL). Elevation of very low-density lipoproteins (VLDL) and high density lipoproteins (HDL Cholesterol) have also been reported. Because of an enhanced esterification of fatty acids at hepatic level [4]. Hypothyroidism, or an under active thyroid, has many causes. Some of the causes are prior thyroid surgery, exposure to ionizing radiation, chronic inflammation of the thyroid (autoimmune thyroiditis), iodine deficiency, lack of enzymes to make thyroid hormone, and various kinds of medication [8]. Thyroid dysfunctions are frequent [15]. Abnormal serum thyrotropin (TSH) values and thyroid dysfunction are more prevalent in women than men and increase with age [16]. Thyroid diseases are classified into two major classes: hypothyroidism and hyperthyroidism. Each of these classes can be further divided according to the etiology of the disease: hypothyroidism can be divided into primary, secondary, and so on [17].

Hypothyroidism is a graded disorder, it may be severe with obvious myxoedema, or moderate to mild or can be sub-clinical hypothyroidism. Deficiency of thyroid hormones affects the entire metabolism of the body [18].

Sub-clinical hypothyroidism (SH), defined as the clinical status of elevated serum TSH levels with normal levels of FT4 and FT3, is a far more common disorder than overt hypothyroidism. The prevalence of SH in the general population is estimated at 4.3% - 9% [19, 20]. SH has a higher prevalence among women and older populations [19, 21, 22]. Moreover, SH may progress to overt hypothyroidism. The rate of progression is higher with the concomitant presence of thyroperoxidase antibodies (TPO-Ab) or higher levels of TSH [23]. SH is associated with increased levels of TC and LDL-C [21, 22, 24, 25, 26, 27]. In addition, some studies have shown that SH dyslipidemia may also be accompanied by increased TGs [28, 29] and decreased HDL-C levels [27, 30]. Moreover, subjects with high normal TSH levels (2-4 mIU/L), but with positive antithyroid antibodies may also exhibit elevated cholesterol levels [31].

Overt hypothyroidism is associated with abnormalities of lipid metabolism, which may predispose to the development of atherosclerotic coronary artery disease (CAD) [4, 32]. Overt hypothyroidism is characterized by hypercholesterolemia and a marked increase in LDL because of a decreased fractional clearance of LDL by a reduced

number of LDL receptors in the liver. However, the controversy persists regarding the lipids level in sub-clinical hypothyroidism and its clinical significance. Moreover it is likely to be a risk factor for atherosclerosis and coronary diseases [4, 9, 33]. Overt and sub-clinical hypothyroidism are associated with hypercholesterolemia mainly due to the elevation of Low-Density Lipoprotein (LDL- c) levels, whereas High-Density Lipoprotein (HDL-c) can be normal or elevated. On the other hand, hyperthyroidism is accompanied by a decrease in serum levels of total LDL-c & HDL-c monitoring their elimination [34]. The amount of Triiodothyronine (T3) converted from Tetraiodothyronine (T4) was a major determinant of serum T3 concentration in normal subjects as well as in patients with hypothyroidism before and after treatment [18].

Hyperthyroidism is characterized by reduced serum TSH levels despite increased free thyroxine (fT4) and free triiodothyronine (fT3) levels. The altered lipid profile is a well-known manifestation of thyroid dysfunction. Both plasma LDL-C and HDL-C increase in hypothyroidism and decrease in hyperthyroidism [35].

Sub-clinical hyperthyroidism is defined by low or undetectable serum thyroid-stimulating hormone levels, with normal free thyroxine and total or free triiodothyronine levels [36]. Hyperthyroidism, or an overactive thyroid, may also be caused by inflammation of the thyroid, Various kinds of medications, and lack of control of thyroid hormone production. The seriousness of thyroid disorders should not be underestimated as thyroid storm (an episode of severe hyperthyroidism) and myxedema coma (the end stage of untreated hypothyroidism) may lead to death in a significant number of cases [8, 37]. The incidence of hyperthyroidism is lower (2.2%) [19]. A decrease in HDL-C levels is also observed in hyperthyroidism, due to the increased CETP-mediated transfer of cholesteryl esters from HDL to VLDL and increased HL-mediated catabolism of HDL2 [38, 39]. Triglyceride levels remain unchanged [40].

Thyroid hormones are involved in regulation of lipid and lipoprotein metabolism; therefore, thyroid dysfunctions induce a significant change in lipid levels [41]. T3 plays a critical role in lipid metabolism by regulating genes involved in lipogenesis and lipolysis [42].

Thyroid hormones induce the 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase, which is the first step in cholesterol biosynthesis. Moreover, triiodothyronine (T3) up regulates LDL receptors by controlling the LDL receptor gene activation. This T3-mediated gene activation is done by the direct binding of T3 to specific thyroid hormone responsive elements (TREs) [43]. Furthermore, T3 controls the sterol regulatory element-binding protein-2 (SREBP-2), which in turn regulates LDL receptor's gene expression [44]. T3 has also been associated with protecting LDL from oxidation [45].

Thyroid hormones can influence HDL metabolism by increasing cholesteryl ester transfer protein (CETP) activity, which exchanges cholesteryl esters from HDL2 to the very low- density lipoproteins (VLDL) and TGs to the opposite direction [46].

In addition, thyroid hormones stimulate the lipoprotein lipase (LPL), which catabolizes the TG-rich lipo proteins, and the hepatic lipase (HL), which hydrolyzes HDL2 to HDL3 and contributes to the conversion of intermediate-density lipoproteins (IDL) to LDL and in turn LDL to small dense LDL (sdLDL) [47, 48]. Another effect of T3 is the up-regulation of apolipoprotein AV (ApoAV), which plays a major role in TG regulation [49]. Indeed, increased levels of ApoAV have been associated with decreased levels of TGs [46].

Proposed mechanisms for this effect include the decrease of hepatic VLDL-TG production and the increase of plasma LPL levels and activity, resulting in the increase of lipoprotein remnant generation due to enhanced LPL-mediated lipolysis of VLDL-TG [50].

The study of Maduka *et al.,* [51] revealed that the hypertensive subjects had increased T_3 and T_4 levels, with increased serum TG and LDL-C. Hypertension and dyslipidemia are major risk factors for cardiovascular disease. So, the serum lipid profile and thyroid hormones may be useful in identification of patients at risk of hypertension since they are useful tests that carry important prognostic information.

2. Objectives

This study was conducted to observe the correlation between hypothyroidism, hyperthyroidism and lipid profile in thyroid dysfunction patients

3. Methodology

The study group consists of 118 subjects of both sex [53 male & 65 female] between the age 20-87. The samples of these patients were collected from Asian Institute of Medical Science at Faridabad region. The subjects were divided into four groups the first group consisting 51 subjects for hypothyroidism which also divided into two subgroups 14 patients suffer from overt hypothyroidism and 37 patients suffering from sub-clinical hypothyroidism, second group for normal conditions or control which consist 20 subject, third group consist 14 patients suffer from hyperthyroidism, and

last group consist 33 patient suffer cardiac disease).

3.1. Collection of Samples and Site of the Experiment

About 3 ml blood samples were collected to detect FT3, FT4, TSH, cholesterol, triglyceride, HDL, LDL, VLDL analyzed in the lab of Asian Institute of Medical Science in Faridabad region.

3.2. Biochemical Analysis

3.2.1. Thyroid Profile

Free Thyroxin (FT 3), Free Triiodothyronine (FT4), and Thyroid Stimulating Hormone (TSH) were done by a fully automatic analyzer.

3.2.2. Lipid Profile

Serum total Cholesterol, HDL- cholesterol, LDL-cholesterol, and were done by a fully automatic analyzer.

3.3. Statistical Analysis

The data was analyzed by graph pad prism software. Student t-test was used for the calculation. $P \leq 0.05$ was considered statically significant.

4. Results

The thyroid dysfunction has a different effect on lipid metabolism, and cause lipid abnormalities as well as carbohydrate and proteins, and its more common in women than men and it increase with progressive age. The various data which have been obtained during the study subjected to statistical analysis in order to find out the mean, standard deviation, P value and t-test of each group of the five groups.

4.1. Lipid Profile in Normal Thyroid Subjects and Cardiac Patients

The mean, standard deviation, P value and t-test value for cholesterol levels in serum of normal thyroid subjects and cardiac patients groups (group I for normal thyroid subjects and group II for patients having cardiac problem) was; 137.25±17.66 in Group I (n= 20), and 194.39±43.84 in Group II (n=33), there is significant difference in the cholesterol levels between the two groups (group I & group II) (Table 1). There is a significant increase in cholesterol level in group II compared to the group I.

The mean, standard deviation, P value, and t-test value for HDL-cholesterol levels in the two groups (group I for normal thyroid subjects and group II for patients having cardiac problem) were; 55.79±10.652 in Group I (n=20), and 39.176±9.794 in Group II (n=33), it was found that there is a significant difference in the HDL-cholesterol levels between the two groups (group I & group II) (Table 1). There is a significant decrease in HD-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for LDL-cholesterol in the two groups were; 75.335±16.540 in Group I (n=20), and 130.115±34.867 in Group II (n=33) (Table 1). In the present study, it was found that there is a significant difference in the LDL-cholesterol levels between the two groups (group I & group II). There is a significant increase in LDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for VLDL-cholesterol in the two groups were; 21.520±5.821 in Group I (n=20), and 27.479±14.758 in Group II (n=33) (Table 1). In the present study, it was found that there is a significant difference in the VLDL-cholesterol levels between the two groups (group I & group II). There is a significant increase in VLDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for triglyceride in the two groups were; 107.60±29.10 in Group I(n=20), and 137.39±73.79 in Group II (n=33), there is not a quite significant difference in the Triglyceride levels between the two groups (group I & group II) (Table 1). There is a significant increase in Triglyceride levels in group II compared to the group I.

4.2. Lipid Profile in Normal Thyroid Subjects and Hypothyroidism Patients

The mean, standard deviation, P value and t-test value for cholesterol in the two groups (group I for normal thyroid subjects and group II for patients having hypothyroidism) were; 137.250±17.663 in Group I (n=20), and 191.839±73.292 in Group II (n=51) (Table 1). In the present study it was found that there is a significant difference in the cholesterol levels between the two groups (group I & group II). There is a significant increase in cholesterol level in group II compared to the group I.

The mean, standard deviation, P value and t-test value for HDL-cholesterol in the two groups Were; 55.790±10.652 Group I (n=20), and 38.435±15.618 Group II (n=51) (Table 1). In the present study it was found that there is significant difference in the HDL-cholesterol levels between the two groups (group I & group II). There is a significant decrease in HDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for LDL-cholesterol in the two groups were; 75.330±16.535 Group I(n=20), and 124.496±57.158 in Group II(n=51) (Table 1). In the present study, it was found that there is a significant difference in the LDL-cholesterol levels between

the two groups (group I & group II). There is a significant increase in LDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for VLDL-cholesterol in the two groups were; 21.520±5.821 Group I(n=20), and 38.9088±38.0257 in Group II(n=51) (Table 1). In the present study, it was found that there is a significant difference in the VLDL-cholesterol levels between the two groups (group I & group II). There is a significant increase in VLDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for Triglyceride in the two groups were; 107.3±29.347 Group I(n=20), and 210.906±221.538 in Group II(n=51) (Table 1). In the present study, it was found that there is not a quite significant difference in the Triglyceride levels between the two groups (group I & group II). There is significant increase in Triglyceride levels in group II compared to the group I.

4.3. Lipid Profile in Normal Thyroid Subjects and Hyperthyroidism Patients

The mean, standard deviation, P value and t-test value for cholesterol in the two groups (group I for normal thyroid subjects and group II for patients having hyperthyroidism) were 137.250±17.663 in Group I(n=20), and 161.25±38.69 in Group II(n=14) (Table 1). In the present study it was found that there is a significant difference in the cholesterol levels between the two groups (group I & group II). There is a significant increase in cholesterol level in group II compared to the group I.

The mean, standard deviation, P value and t-test value for HDL-cholesterol in the two groups Were; 55.790±10.652 Group I(n=20) and 40.367±7.930 Group II(n=51) (Table 1). In the present study, it was found that there is significant difference in the HDL-cholesterol levels between the two groups (group I & group II). There is significant decrease in HDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for LDL-cholesterol in the two groups were; 75.335±16.54 Group I(n=20), and 104.117±33.39 Group II(n=51) (Table 1). In the present study it was found that there is significant difference in the LDL-cholesterol levels between the two groups (group I & group II). There is significant increase in LDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for VLDL-cholesterol in the two groups were; 21.520±5.821 Group I(n=20), and 20.650±6.737 Group II(n=14) (Table 1). In the present study it was found that there is significant difference in the VLDL-cholesterol levels between the two groups (group I & group II). There is significant decrease in VLDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for Triglyceride in the two groups were; 107.60±29.10 Group I(n=20), and 103.25±33.68 Group II(n=14) (Table 1). In the present study it was found that there is not quite significant difference in the Triglyceride levels between the two groups (group I & group II). There is significant increase in Triglyceride levels in group II compared to the group I.

4.4. Lipid Profile in Patients with Hyper-thyroidism and Hypothyroidism

The mean, standard deviation, P value and t-test value for cholesterol in the two groups (group I for hyperthyroidism patients and group II for patients having hypothyroidism) were; 161.250±38.688 Group I(n=14), and 192.075±73.220 Group II(n=51) (Table 2). In the present study, it was found that there is no significant difference in the cholesterol levels between the two groups (group I & group II).

The mean, standard deviation, P value and t-test value for HDL-cholesterol in the two groups were; 40.53±37.658 Group I(n=14), and 39.024±16.138 Group II(n=51) (Table 2). In the present study it was found that there is no significant difference in the HDL-cholesterol levels between the two groups (group I & group II).

The mean, standard deviation, P value and t-test value for LDL-cholesterol in the two groups were; 104.117±33.390 Group I(n=14), 123.914±55.893 Group II(n=51) (Table 2), it was found that there is no significant difference in the LDL-cholesterol levels between the two groups (group I & group II).

The mean, standard deviation, P value and t-test value for VLDL-cholesterol in the two groups were; 20.6500±6.7367 Group I(n=14), and 42.1812±44.3076 Group II (n=51), there isn't significant difference in the VLDL-cholesterol levels between the two groups (group I & group II) (Table 2).

The mean, standard deviation, P value and t-test value for Triglyceride in the two groups were; 103.250±33.683 Group I(n=14), and 210.91±221.53 Group II(n=51) (Table 2). In the present study it was found that there is not quite significant difference in the Triglyceride levels between the two groups (group I & group II). There is significant increase in Triglyceride levels in group II compared to the group I.

4.5. Lipid Profile in Overt Hypothyroidism and Sub-clinical Hyperthyroidism

The mean, standard deviation, P value and t-test value for cholesterol in the two groups (group I for overt hypothyroidism patients and group II for patients having sub-clinical hypothyroidism) were; 197.07±117.03 Group I(n=14), and 191.717±49.913 Group II(n=37) (Table 3). In

the present study, it was found that there isn't a significant difference in the cholesterol levels between the two groups (group I & group II). There is a significant increase in cholesterol level in group II compared to the group I.

The mean, standard deviation, P value and t-test value for HDL-cholesterol in the two groups were; 38.136± 17.329 Group I(n=14), and 38.549±15.175 Group II(n=37) (Table 3). In the present study, it was found that there is not a significant difference in the HDL-cholesterol levels between the two groups (group I & group II). There is a significant increase in HDL- cholesterol levels in group II compared to the group I.

Table 1. Serum lipid profile in different groups.

Groups Parameters	Normal Thyroid Subjects (n= 20)	Cardiac Patients (n=33)		Hypothyroidism Patients (n=51)		Hyperthyroidism Patients (n=14)	
	Mean ±SD	Mean ±SD	t-test	Mean ±SD	t-test	Mean ±SD	t-test
TC (mg/dl)	137.25±17.66	194.39±43.84*	5.55	191.84±73.29*	3.28	161.25±38.69*	2.41
HDL-C (mg/dl)	55.79±10.65	39.18±9.79*	5.79	38.44±15.62*	4.56	40.37±7.930*	4.34
LDL- C (mg/dl)	75.34±16.54	130.12±34.87*	6.57	124.50±57.16*	3.77	104.12±33.39*	3.27
VLDL- C (mg/dl)	21.52±5.82	27.48±14.76	1.72	38.91±38.03*	2.03	20.65±6.74	0.39
Triglycerides (mg/dl)	107.60±29.10	137.39±73.79	1.72	210.91±221.53*	2.08	103.25±33.68	0.39

*: Significant $P \leq 0.05$ as compared to normal thyroid subjects

Table 2. Serum lipid profile in hyperthyroidism patients and hypothyroidism patients.

Groups Parameters	Hyperthyroidism Patients (n=14)	Hypothyroidism Patients (n=51)	
	Mean ±SD	Mean ±SD	t-test
TC (mg/dl)	161.25±38.69	191.84±73.29	1.41
HDL-C (mg/dl)	40.37±7.930	38.44±15.62	0.31
LDL- C (mg/dl)	104.12±33.39	124.50±57.16	1.17
VLDL- C (mg/dl)	20.65±6.74	38.91±38.03	1.67
Triglyceride (mg/dl)	103.25±33.68	210.91±221.53	1.67

The mean, standard deviation, P value and t-test value for LDL-cholesterol in the two groups were; 130.900±96.704 Group I(n=14), and 122.073±33.743 Group II(n=37) (Table 3). In the present study, it was found that there is a significant difference in the LDL-cholesterol levels between the two groups (group I & group II). There is a significant increase in HDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value, and t-test value for VLDL-cholesterol in the two groups were; 33.1714±18.4367 Group I(n=14), 45.8605±50.5290 Group II(n=37) (Table 3). In the present study, it was found that there is not a significant difference in the VLDL-cholesterol levels between the two groups (group I & group II). There is a significant increase in VLDL-cholesterol levels in group II compared to the group I.

The mean, standard deviation, P value and t-test value for Triglyceride in the two groups were; 165.857±92.184 Group I(n=14), and 227.951±253.00 Group II(n=37) (Table 3). In the present study, it was found that there is not a quite significant difference in the Triglyceride levels between the two groups (group I & group II). There is a significant increase in Triglyceride levels in group II compared to the group I.

Table 3. Serum lipid profile in overt hypothyroidism and sub-clinical hypothyroidism patients.

Groups Parameters	Overt Hypothyroidism Patients (n=14)	Sub-clinical Hypothyroidism Patients (n=37)	
	Mean ±SD	Mean ±SD	t-test
TC (mg/dl)	197.07±117.03	191.72±49.91	0.23
HDL-C (mg/dl)	38.14± 17.33	38.55±15.18	0.08
LDL- C (mg/dl)	130.90±96.70	122. 07±33.74	0.49
VLDL- C (mg/dl)	33.17±18.44	45.86±50.53	0.91
Triglycerides (mg/dl)	165.86±92.18	227.95±253.00	0.89

5. Discussion

Thyroid disease, namely hypothyroidism and hyperthyroidism, constitutes the most common endocrine abnormality in the recent years, diagnosed either in sub-clinical and clinical form. According to the 6-year duration NHANESIII study, the prevalence of hypothyroidism was 6.4% (0.3% clinical and 4.3% sub-clinical) and of the hyperthyroidism, 1.3% (0.5% clinical, and 0.7%subclinical), in the population aged at least 12 years, showing an age and sex dependence [20].

There is an increase in cholesterol, LDL cholesterol, VLDL-cholesterol, and triglyceride level and decrease HDL cholesterol level in cardiac patients compared with the normal thyroid subjects. There is an increase in cholesterol and LDL cholesterol level in hypothyroid patients compared with the normal subjects, this is due to decreased thyroid function is accompanied by reduced activity of HMG-CoA reducatase, TC and LDL-C levels are increased in patients with overt hypothyroidism [52]. This is due to the decreased LDL-receptors' activity, resulting in the decreased catabolism of LDL and IDL [53]. The HDL-C level in normal thyroid subjects and hypothyroid patients. It is revealed from data

that is a significant difference between two groups. There is a decrease in HDL-C level in hypothyroid patients compared with normal thyroid subjects it is supported by Adgeppa [54].

There is an increase in LDL and triglyceride levels and VLDL in hypothyroid patients compared with the normal subjects, this is due to decreasing the clearance of TG-rich lipoproteins. Therefore, overt hypothyroid patients may also present with elevated TG levels associated with increased levels of VLDL and occasionally fasting chylomicronemia [55].

Hypothyroidism is a common problem that reduces the functional ability of life. Hypothyroidism is associated with altered lipid levels, which increases the cardiovascular risk [56]. In the present study, there is an increase in the cholesterol and LDL-L levels in hyperthyroid patients compared with normal subjects. This due to the increased activity of HMG-Co A reductase, the cholesterol levels tend to be increased in hyperthyroidism due to augmented excretion of cholesterol by bile together with enhanced receptor mediated catabolism of LDL particles. It is supported by Duntas [57]. Representing the HDL-C level in normal thyroid subjects and hyperthyroidism patients. It is revealed from data that is significant in different between two groups. there is a decrease in the HDL-C level in the hyperthyroid patients compared with the normal subjected. This is due to the increased CETP-mediated transfer of cholesteryl esters from HDL to VLDL and increased HL-mediate catabolism of HDL2. It is supported by Kung *et al.*, [58].

Regarding Lipid profile in the overt and sub-clinical hypothyroidism patients, cholesterol, HDL-C, LDL cholesterol, V-LDL cholesterol, and triglyceride levels in overt and sub-clinical hypothyroidism patients, revealed from data that it is no significance different between the two groups (overt hypothyroidism and sub-clinical hypothyroidism). The severity of lipid abnormality does not parallel with the degree of hypothyroidism [59].

Regarding Lipid profile in the hyperthyroid and hypothyroid patients. It is revealed from data that it is no significant difference between the two groups (hyperthyroidism patients and hypothyroidism patients).

6. Conclusion

The present study demonstrated multiple biochemical abnormalities in the serum lipids and enzymes in hypothyroidism and hyperthyroidism subjects. It is concluded from the present study there is an increase in the most lipid profile in both hypothyroid and hyperthyroid patients. and finally, dyslipidemia which is one of the major risk factors for atherosclerosis and coronary disease. There is an increase in total cholesterol, LDL VLDL, and levels and decreased in HDL C in hypothyroidism patients. And there is also increase in total and LDL cholesterol, and decreased in HDL C level in hyperthyroidism patients, within no changes in VLDL and levels, and there is no significant between two groups (Hypothyroidism and Hyperthyroidism).

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