

Evaluation of some Biochemical parameters in serum patients with thyroid gland dysfunction

Mohammad F. Hashim, Dawood S. Ail and Ahmad Y. Issa

Dept. of chemistry, College of Science, Basra University, Basra , Iraq.

Mohammafalih91@gmail.com

Abstract

Thyroid gland is one of the most important endocrine glands in the body that regulates a wide array of parameters such as lipid profiles, homocystein and malandialdehyde level. The present study included 50 patients with thyroid dysfunction and equal number matched healthy control. The results obtained from the present study, Have reported a significant increase in (TC, TG and LDL) level and significant decrease in level of HDL at ($p < 0.01$) in the Hyperthyroidism patients compared with control. while in the hyperthyroidism the data in this study show significant decrease in the level of TG and LDL ($P < 0.01$) and increase HDL level at ($p < 0.01$) compared with control. While No significant difference was shown in TC level in hyperthyroidism. Furthermore, this study showed high significant for MDA level ($p < 0.01$) in both hypo and hyperthyroidism compared with control . in this work, there was significantly increased ($P < 0.01$) in serum HOMS in hypothyroidism compared with control, and no significantly in hyperthyroidism. Moreover , the results showed significant decrease TSH level and significant increase T4 and T3 at ($P < 0.01$) in hyperthyroidism compared with control. the study has also reported significant elevation for TSH level and significant lower for T4 and T3 at ($P < 0.01$) in hypothyroidism compared with control .

Objective: The present study showed a biochemical relationship between thyroid dysfunction and lipid profiles, homocystein and malandialdehyde .

Keyworld : thyroid dysfunction, hypothyroidism, hyperthyroidism, malondialdehyde, Homocystein, lipid profile.

1. INRODUCTION

Thyroid hormones have profound metabolic consequences, the most substantially movement being motion being an growth in strength expenditure [1-2]. Thyroid hormones play a crucial position in regulating lipid metabolism; and thyroid dysfunctions can bring about lipid abnormalities which boom the danger of endothelial disorder, high blood pressure and cardiovascular ailment [3]. Hypothyroidism is a commonplace sickness inside the populace and is the maximum commonplace thyroid disease. Also, it's miles arise while degrees of thyroid hormones tetra-iodothyroxine (T4) and tri-iodothyroxine (T3) are low and

thyroid stimulating hormone (TSH) is excessive. It became discovered that hypothyroidism impacts girls approximately 2-eight instances as regularly as men [4].

Hyperthyroidism is A medical case resulted from elevated T4 and T3 ranges and reduced TSH , and is characterized by using hyperactivity, anxiousness, restlessness tachycardia and cardiac arrhythmia, and weight reduction because of accelerated BMR[5].

thyroid hormones regulates biosynthesis and degradation of cholesterol and mediates the activity of key enzymes. The cholesterol-reducing impact in particles happens via expended expression of LDL receptors on the hepatic and peripheral stages. The truth that T₃ regulates LDL receptors [6].

Thyroid hormone performs a function in each lipogenesis and lipolysis. Lipoprotein Lipase (LPL) is a crucial enzyme that accountable for getting rid of Triglyceride (TG) from circulating chylomicrons and Very Low Density Lipoproteins (VLDL), this regulates by using thyroid hormone . LPL catalyzes TG breakdown into non-esterfied fatty acid and transporting to adipose tissue wherein it re-esterfied and garage as TG. Also, the fatty acids yield from LPL hydrolysis TG as power supply for coronary heart Additionally, TH influences TG ranges entails angioprotein-like3(ANGPTL3) [7].

Thyroid disorder impact on oxidative strain displaying its affiliation with abnormally regulated oxidative or anti-oxidative molecules. Although, the excessive reactivity and brief 1/2-existence of reactive oxygen and poly unsaturated fatty acid (PUFA) or nitrogen species make tough their direct dedication , numerous techniques had been attempted. An advocated method was applied for the dedication of oxidative strain in human serum through malondialdehyde (MDA) [8-9].

Total homocysteine (tHcy) is an impartial danger aspect for cardiovascular sickness . In the existing take a look at we investigated serum tHcy degrees and its dating to thyroid feature checks (T3, T4 and TSH) in hypothyroid sufferers in comparison to govern organization [10].

2. Experimental

2-1: Material and Methods

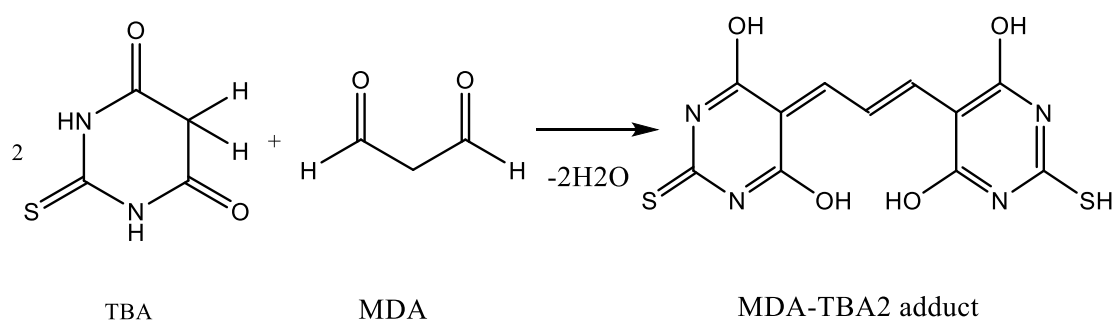
Fifty (50) female patients were enrolled in the present study , (25 with hypothyroidism and 25 with hyperthyroidism) with new diagnosed thyroid diseases by clinical examination , laboratory test and radiology. They were free of diabetes mellitus, hypertension and cardiovascular . Aged between 20-50 five years and 50 well know healthy women, aged range between 20-50 years Selected as a control group.

2-2: Sample collections and measuring of parameters

Patients samples were collected from AL-Fayhaa General Hospital and AL- Shafaa General Hospital . About 5mL of the blood was drawn from a forearm vein of fasting (10 -12 hours) patients. healthy control were collected from friends and colleagues . venous blood sample were dispensed in to vacutainer plain tubes . After clotting ,it was then centrifuged at 5000 RPM for 10 min. the serum was stored at -20C° until assayed .T3, T4and TSH measurements were performed by using Enzyme linked immunosorbent assay(ELISA) by Mini-Vidas instrument. Total cholesterol (TC), triglyceride (TG) and high density lipoprotein (HDL) were determined by spectrophotometer, low density lipoprotein (LDL), are calculated by the Friedewald formula:

$$\text{LDL mg/dL} = \text{TC} - (\text{HDL} + \text{TG}/5)$$

Malodialdehyde assay was based on the reaction of MDA with thiobarbituric acid (TBA) formation an MDA-TBA2 adduct (pink color) that absorbs strongly at (532nm) as in Figure below.



Homocysteine assay is a chemiluminescent micropartical immunoassay (CMIA) for the quantitative determination of total L-homocysteine in human serum or plasma on the ARCHITECH I system .Bound or dimerised homocysteine (oxidized form) is reduced by dithiothretol (DTT)to free homocysteine, which is then converted to S-adenosyl homocysteine (SAH)by the action of the recombinant enzyme S-adenosyl homocysteine hydrolase (rSAHHase) in the presence excess adenosine .

2-3: Statistical analysis

Data of current study were Analyzed by chi-square to compared between percentages, (T test) to compared between two numeric groups (Mean $\pm$ SD), and (F test (ANOVA)) to compared between more than two numeric groups (Mean $\pm$ SD), and used (r) to study correlation relationship between numeric variables . A level of significance of $P=0.05$ was applied to test. (SPSS v.21) program used to analyse current data .

3- Results

3-1: Relationship between hypothyroidism and control

The mean and standard division (SD) of lipid profiled, malodialdehyde, homocystein and thyroid hormones showed in Table 1 and figures 1 for patient compared with control.

Table (1) : Levels of biochemical parameters in Hypothyroidism and Control

Test	Hypothyroidism (N=25) (Mean ±SD)	Control (N=50) (Mean±SD)	P-Value
T3 (nmol/L)	0.861 ± 0.409	1.868 ± 0.551	0.001
T4 (nmol/L)	40.49 ± 21.008	95.024 ± 14.043	0.001
TSH(μUI /mL)	46.46 ± 37.012	2.144 ± 0.987	0.001
Ch (mg/dl)	239.40 ± 36.83	144.98 ± 17.93	0.001
TG (mg/dl)	207.84 ± 29.13	113.50 ± 15.91	0.001
HDL (mg/dl)	26.41 ± 4.34	45.04 ± 6.47	0.001
LDL (mg/dl)	140.99 ±47.32	82.72 ± 9.69	0.001
VLDL (mg/dl)	41.028 ± 4.2048	24.25 ± 3.84	0.001
MDA (nmol/mL)	13.66 ± 3.25	12.62 ± 56.20	0.001
HOMS(umol/L)	17.96 ± 14.12	8.08 ± 3.10	0.001

Result given in mean and ±SD ●

● P-Value equal or less than 0.01 levels considered significant

Table (1) and Figure (1) showed the (Mean ±SD) and P-Value for thyroid hormones , lipid profiles, MDA and HOMOS in hypothyroidism and compare with control ,highly significant different at (.8616 ± .4095) , (40.49 ± 21.008) and (46.46 ± 37.012) was seen then with control group (1.868 ± 0.551),(95.024 ± 14.043) and (2.144 ± 0.987) for T3,T4and TSH respectively . total cholesterol, TG ,LDL-C and VLDL-C were significant increase (239.40 ± 36.83),(207.84 ± 29.13) , (140.99 ±47.32) and (41.028 ± 4.2048) respectively comparison with control group (144.98

± 17.93), (113.50 ± 15.19), (82.72 ± 9.69) and (24.25 ± 3.84) respectively. while significant decrease at (26.41 ± 4.34) for HDL compare with control (45.04 ± 6.47). Also there are alteration between MDA, HOMO (13.66 ± 3.25) and (17.96 ± 14.12) respectively in comparison with control group (12.62 ± 56.20) and (8.08 ± 3.10) .

3-2: Relationship between hyperthyroidism and control

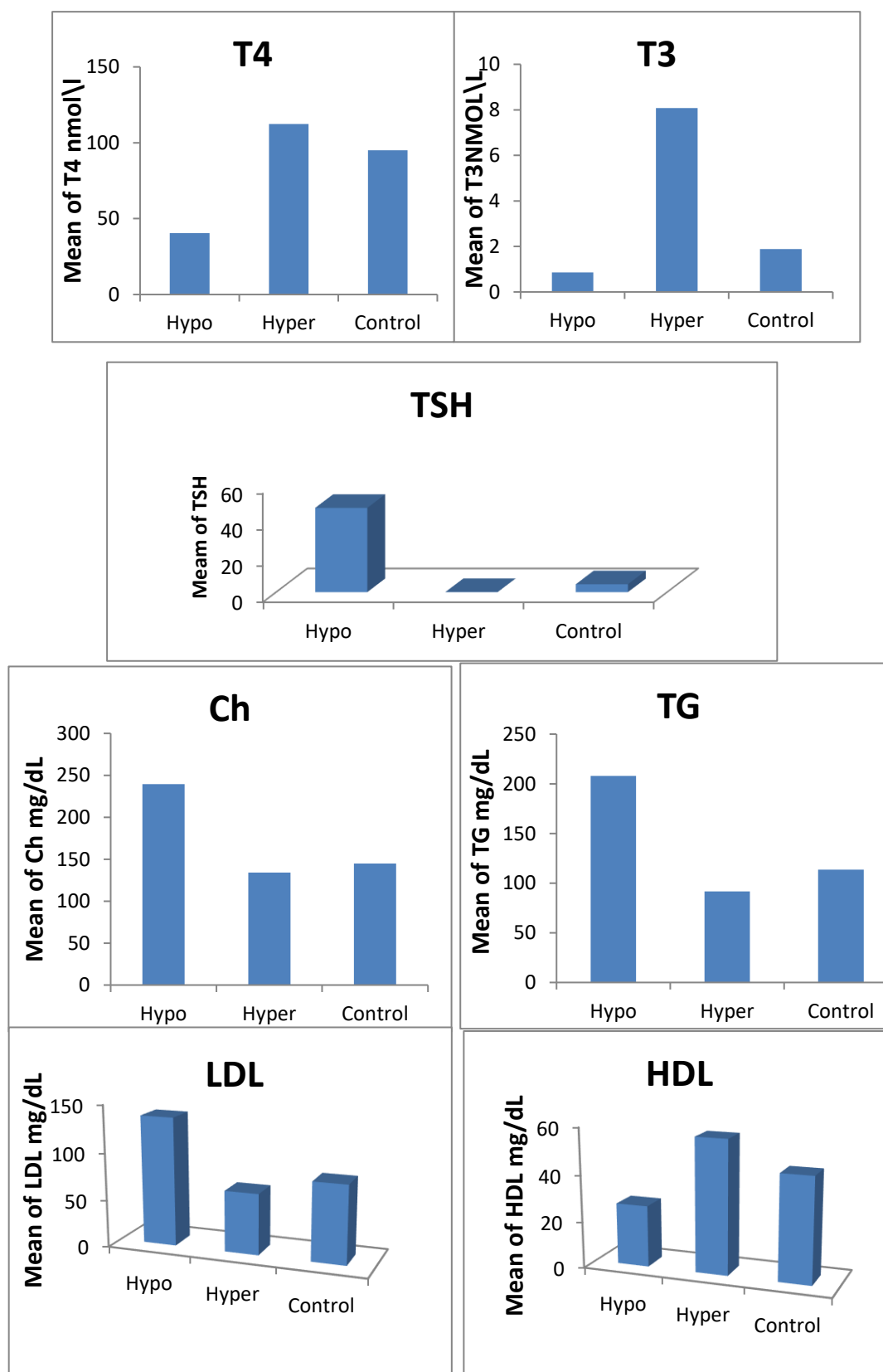
The mean and standard deviation (SD) of lipid profiled, malodialdehyde, homocystein and thyroid hormones showed in Table 2 and figure 1 for patient Compared with control.

Table (2) : Biochemical parameter in Hyperthyroidism and Control

Test	Hyperthyroidism (N=25) (Mean $\pm$ SD)	Control (N=50) (Mean $\pm$ SD)	P-Value
T3 (nmol/L)	8.079 $\pm$ 2.091	1.868 $\pm$ 0.551	<0.001
T4 (nmol/L)	216.781 $\pm$ 25.410	95.024 $\pm$ 14.043	<0.001
TSH(μ UI /mL)	0.083 $\pm$ 0.07627	2.144 $\pm$ 0.987	<0.001
Ch (mg/dl)	134.12 $\pm$ 17.761	144.98 $\pm$ 17.93	0.068
TG (mg/dl)	91.68 $\pm$ 24.322	113.50 $\pm$ 15.91	<0.001
HDL (mg/dl)	57.240 $\pm$ 10.966	45.04 $\pm$ 6.47	<0.001
LDL (mg/dl)	72.040 $\pm$ 14.8646	82.72 $\pm$ 9.69	0.041
VLDL (mg/dl)	18.240 $\pm$ 4.6303	24.25 $\pm$ 3.84	<0.001
HOMS(μ mol/l)	8.3604 $\pm$ 3.20742	8.08 $\pm$ 3.10	0.956
MDA (nmol/ml)	14.424 $\pm$ 3.7457	12.62 $\pm$ 56.20	<0.001

Table (2) and figure (1) showed that thyroid hormones and lipid profiles in hyperthyroidism compare with control, highly significant different at (8.0792 ± 2.091) , (216.781 ± 25.410) and (0.083 ± 0.07627) was seen then with control group (1.868 ± 0.551), (95.024 ± 14.043) and (2.144 ± 0.987) for T3, T4 and TSH respectively .No significant between total cholesterol compare with control. HDL-C, VLDL were significant at (57.240 ± 10.966), (18.24 ± 4.630) respectively comparison with control (45.04 ± 6.47) and (24.25 ± 3.84). LDL-C was significant at (72.040 ± 14.8646) compare with control (82.72 ± 9.69). No significant between homocystein level

(8.3604 ± 3.20742) compression with control (8.08 ± 3.10). While malondialdehyde was high significant at (14.424 ± 3.745) compare with control (12.62 ± 56.20)



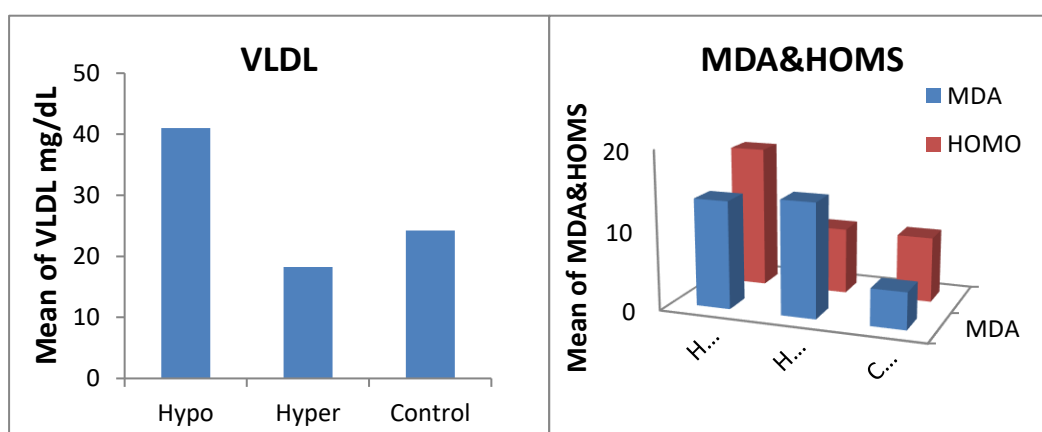


Figure (1): Mean values for biochemical parameters in the studied groups.

3-3:Correlation of thyroid hormones and other parameter in hypothyroidism.

In hypothyroidism, thyroid stimulating hormone (TSH) was found positive correlation with TG and VLDL($r=0.162, r=0.303$) respectively, respectively as shown in Tab(3). And high significant negative correlation with T_4 , T_3 , TC, HDL-C, LDL-C, HOMS and MDA($r=-0.505^{**}$, $r=-0.643^{**}$, $r=-0.228$, $r=-0.042$, $r=-0.116$, $r=-0.338$ and $r=-0.106$) respectively as show in Tab(3).

High significant positive correlation between T_4 with T_3 , TC, HDL, LDL, HOMS and MDA, ($r=0.710^{**}$, $r=0.386$, $r=0.213$, $r=0.279$, $r=0.214$ and $r=0.161$) with T_4 respectively as show in Tab(3) also, showed a significant negative correlation between TG and VLDL($r=-0.001$ and $r=-0.178$) with T_4 as shown in Tab (3).

Result in Tab(3), illustrated a significant positive correlation in T_3 levels TC, HDL, LDL, HOM and MDA respectively($r=0.061, r=0.035, r=0.145, r=0.191$ and $r=0.508^{**}$) and negative correlation with TG and VLDL which ($r=-0.106$ and $r=-0.114$) with T_3 as shown in Tab (3).

Table(3):Show correlation between thyroid hormones and other parameter in hypothyroidism.

Variables	TSH	T4	T3
	R	r	r
TC	- 0.228	0.386	0.061
TG	0.162	-0.001	-0.106
HDL	-.042	0.213	0.035
LDL	-0.116	0.279	0.145
VLDL	0.303	-0.178	- 0.114
HOMS	-0.335	0.214	0.191
MDA	- 0.106	0.161	0.508**

3-4: Correlation of thyroid hormones and other parameter in hyperthyroidism.

In hyperthyroidism TSH was high significant positive correlation with TC, TG, LDL, VLDL and HMOS($r=0.470^*$, $r=0.436^*$, $r=0.484^*$ and $r=0.466$) respectively, as shown in Tab(3-4). And negative correlation with T_4 , T_3 , HDL and MDA($r=-0.499^*$, $r=-0.534^{**}$, $r=-0.381$ and $r=-0.250$) as show in Tab(4).

Results in table (4) illustrated a significant negative correlation in T_4 levels with TC, TG, HDL, LDL and VLDL respectively($r=-0.322$, $r=-0.093$, $r=-0.120$, $r=-0.241$ and $r=-0.123$). While a significant positive correlation in T_4 level with T_3 , HOMS and MDA($r=0.142$, $r=0.107$ and $r=0.238$).

A significant positive correlation between T_3 and TC, HDL, HOMS and MDA levels which ($r_1=0.001$, $r_2=0.448^*$, $r_3=0.354$ and $r=0.575^{**}$) respectively. While negative correlation with TG, LDL and VLDL which($r=-0.282$, $r=-0.264$ and $r=-0.0292$) .

Table(4):Show correlation between thyroid hormones and other parameter in hyperthyroidism.

Variables	TSH	T4	T3
	R	r	r
TC	0.470*	-0.322	0.001
TG	0.436*	-0.093	-0.282
HDL	-0.381	-0.120	0.448*
LDL	0.489*	-0.241	-0.264
VLDL	0.466*	-0.123	-0.292
HOMS	0.080	0.107	0.354
MDA	-0.250	0.238	0.575**

**Correlation is significant at <0.01 level (2- tailed)

*Correlation is significant at 0.05 levels (2-tailed).

r = strength of correlation, (-) inversely correlation, (+) proportional correlation

4-Discussion

Thyroid gland characteristic controls a big range of metabolic parameters. Thyroid function drastically impacts lipoprotein metabolism in addition to a few cardiovascular disorder (CVD) risk elements [6-11]. Indeed, inside the case of excessive stage variety of thyroid stimulating hormone (TSH) values, there are a linear growth in general cholesterol (TC), low-density lipoprotein LDL-cholesterol (LDL-C) and triglycerides (TGs) and there are a linear lower in high-density lipoprotein cholesterol (HDL-C) and this we found in this study [12]. Thyroid hormones induce the 3-hydroxy-three-methylglutaryl-coenzyme A (HMG-CoA) reductase, that's step one in cholesterol biosynthesis. Furthermore, (T3) Up – regulates LDL receptors by way of regulation the LDL receptor gene activation. This T3-mediated gene activation is completed by means of the direct binding of T3 to particular thyroid hormone responsive factors (TREs) [13]. Furthermore, T3 controls the sterol regulatory regulatory-binding protein-2 (SREBP-2), which in flip regulates LDL receptor's gene expression [14]. T3 has additionally been related to defensive

LDL from oxidation . Thyroid hormones can have an impact on HDL metabolism by using growing cholesteryl ester transfer protein (CETP) interest, which exchanges cholesteryl esters from HDL2 to the very low density lipoproteins (VLDL) and TGs to the alternative course[15] . In addition, thyroid hormones stimulate the lipoprotein lipase (LPL), which catabolizes the TG-rich lipoproteins, and the hepatic lipase (HL), which hydrolyzes HDL2 to HDL3 and contributes to the conversion of intermediate-density Lipoproteins (IDL) to LDL and in flip LDL to small dense LDL (sdLDL) [16]. Hyperthyroidism is characterized by decreased serum TSH ranges in spite of expanded thyroxine (T4) and triiodothyronine (T3) levels. Altered lipid profile is a well-known manifestation of thyroid disorder. Serum HDL-C boom in hypothyroidism and reduce in hyperthyroidism [17-21]. As we stated on this paper. The most important reason of the variations in general cholesterol level was the changes of LDL-C ranges. In hyperthyroidism, the growth in LDL receptor mRNA results in a growth of activity and quantity of low density lipoprotein receptors . these in flip, ends in a lower in level of LDL-Cholesterol and total cholesterol level [22-23].

The levels of general LDL-cholesterol, LDL-cholesterol lower in patients with hyperthyroidism because of the accelerated activity of HMG Co A reductase and expanded bile excretion of LDL-cholesterol and particularly Caused by expanded LDL receptor gene expression ensuing in more desirable LDL receptor mediated catabolism of LDL particles. Cholesterol level stay unchanged in hyperthyroidism, that is provide an explanation for our effects as we suggested [24-25] .

Malondialdehyde (MDA) was high in each hyperthyroid and hypothyroid case in comparison to controls , this study agreed with O. Anjaneyulu1, Supraja Pottennagari et.al and Videla *et al* [26].

Increase the homocystein in hypothyroidism compared with control ,whilst no change among hyperthyroidism and control. Thyroid hormone deficiency result in decreases hepatic degrees of enzymes invlved within the remethylation pathway of Hcy [27]. The observations that methylenetetrahydrofolate reductase (MTHFR) is expanded in hyperthyroidism and reduced in hypothyroidism can be applicable for the relation among the Hcy level and thyroid status. This enzyme is liable for the formation of five-methyl-tetrahydrofolate, which features as methyl donor for the duration of remethylation of Hcy to methionine [28-29].

Conclusions: In this paper we have reported The relationship between some biochemical parameter with thyroid dysfunction patients, like evolution of lipid profiles (TC,TG,LDL,VLDL) compare with control group ,while (HDL) was decreased. In addition we reported no significant relationship between total homocystein in the patient compared with control in hypothyroidism. Also the result indicated that the level of MDA were significant rise in both hypo and hyperthyroidism

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تقييم بعض المتغيرات الحيوية في مصل مرضى الخلل الوظيفي للغدة الدرقية

محمد فالح هاشم, داوود سلمان علي, احمد يحيى عيسى

جامعه البصرة- كلية العلوم- قسم الكيمياء

الخلاصة

الغدة الدرقية واحدة من اهم الغدد الصماء الموجودة في الجسم تؤثر على عدة وظائف ومتغيرات حيوية مثل الدهون, الهموسستين ومضادات الاكسدة (MDA). الدراسة تضمنت 50 مريض بخلل الغدة الدرقية وعدد مساوي كمجموعة سيطرة. النتائج التي حصلنا عليها في هذه الدراسة بينت ان هنالك زيادة معنوية في مستوى كل من الدهون العامة, الدهون الثلاثية و الدهون الضارة (TC, TG and LDL-C) ونقصان معنوي في مستوى الدهون الحميدة (HDL-C) عند ($P < 0.01$) في مرضى خمول الغدة الدرقية hypothyroidism مقارنة مع مجموعة السيطرة Control. بينما بينت النتائج في مرضى فرط نشاط الغدة الدرقية hyperthyroidism نقصان معنوي عند ($p < 0.01$) لكل من TG, LDL-C. وزيادة معنوية في مستوى HDL-C عند ($p < 0.01$) مقارنة مع مجموعة السيطرة. كذلك اوضحت الدراسة عدم وجود فرق معنوي لمستوى TC (cholesterol) في مرضى فرط نشاط الغدة الدرقية مقارنة بالاصحاء. علاوة على ذلك هذه الدراسة وجدت هنالك فروقات معنوية وزيادة لمستوى المالونداي الدهايد (MDA) في كل من مرضى فرط نشاط الغدة وخمولها عند ($p < 0.01$) مقارنة بالأشخاص الاصحاء. في هذا العمل وجد هنالك فرق معنوي لمستوى homocystein عند ($p < 0.01$) في مرضى خمول الغدة الدرقية مقارنة مع مجموعة السيطرة. بينما لا توجد فروقات معنوية لمستوى homocystein في فرط نشاط الغدة الدرقية مقارنة مع الاصحاء.