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Thyroid Hormones and Lipid Profile Abnormalities

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Original Research Article

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Abstract: This study was aimed to investigate the association between thyroid disorders and lipid profile in 122 patients (100 females and 22 males) referred to the Specialized Center for Endocrinology and Diabetes at Al –kindy Hospital in Baghdad . For comparison, 60 healthy individuals (31 females and 29 males), who had no thyroid disorders, were also included in the study. Blood samples were collected from both patients and the healthy individuals. Enzyme Linked Fluorescent Assay (ELFA) technique through using Vitek Immuno Diagnostic Assay System (VIDAS) was applied to measure levels of the thyroid hormones (tri-iodothyronine T3, tetra-iodothyroxine T4) and thyroid stimulating hormone (TSH). From the results obtained, patients were classified into three groups: 40 were considered as belonging to the controlled * group (26 females and 14 males), 57 to the hypothyroidism group (52 females and 5 males) and 25 belonged to hyperthyroidism group (22 females and 3 males). Females constituted the vast majority of both healthy and thyroid disorders patients with percentages of (51.7%) and (81.96%), respectively. The results also declared that there was a correlation between increasing the cholesterol level and decreasing level of high density lipoprotein (HDL).
Keywords: Thyroid, Hormones, Lipid Profile, Abnormalities.

INTRODUCTION

Thyroid gland is one of the important organ in the human body that produces important hormones: triiodothyronineT3 and tetraiodothyroxine T4 which have an important role in regulation of metabolic functions, development and growth thus thyroid dysfunction affecting various vital activities; those resulting from hypo or hyper thyroid gland activity leading to increase or decrease thyroid hormones T3 and T4 [1]. Hypothyroidism(Hashimotos' thyroiditis) and hyperthyroidism (Graves' disease) are the most common autoimmune thyroid disorders as one of most complications of thyroid dysfunctions as well autoimmune diseases occur when immune system begins to attack its own self antigens, so, that the best feature of autoimmune thyroid disease is the presence of auto- antibodies against thyroid antigens[2,3].

MATERIALS AND METHODS

Sample collection

A total of 182 samples were collected from Iraqi individuals who attended to the Specialized Center for Endocrinology and Diabetes at Al Kindy teaching Hospital in Baghdad during the period from October 2012 to January 2013. Samples included 60 healthy individuals (31 females and 29 males) and 122 thyroid patients (100 females and 22 males) .Thyroid patients were divided into three subgroups: 40 patients were considered as a controlled group (individuals who have been under thyroid drug treatment either thyroixne or carbimazole) contains 40 patients (26 females and 14 males), 57 patients belong to hypothyroid group (52 females and 5 males) and 25 patients hyperthyroid group (22 females and 3 males). All of them were subjected to a personal interview to fill specialized designed questionnaire form with a personal and medical history aspect. Measurement of Tri-iodothyronine (T3) ,tetra iodothyroixine (T4) and Thyroid Stimulating Hormone (TSH) by Enzyme Linked Fluorescent assay (ELFA) using BioMérieux kit (France) [4].Lipid profile assay using (cholesterol , triglycerides and HDL) kits, linear chemicals (Spain) [5,6].LDL and VLDL estimation [7, 8]. All the Statistical Analysis and Findings results were supervised by Bio-Statistician Prof. (Dr.) Abdulkhaliq Al-Naqeeb, College of Health and Medical Technology, Baghdad – Iraq.

RESULTS AND DISCUSSIONS

Table-1: One - Way ANOVA for testing equality of Means and Levene Test for equality of variances for Thyroids Function Parameters among the Studied samples

Parameters	Levene's Test for Equality of Variances		ANOVA for Equality of Means		Comparison Significant
	F- statistics	Sig. (*)	F - statistics	Sig. (*) (2-tailed)	
T3	1.182	0.321	5.179	0.002	HS
T4	2.450	0.066	4.066	0.008	HS
TSH	76.070	0.000	50.746	0.000	NS

(*) HS: Highly Significant at P< 0.01

Showed the results of ANOVA technique for testing equality of mean values of thyroids function (T3, T4, and TSH) parameters among different of the studied samples. The result showed that highly significant different at(P<0.01) were reported and that results is not enough to reject the statistical hypothesis, which says that the four groups having corresponding proportionally /or whether the different groups were seems to be drown from the same population, and for exploring the nature of real /or actual differences among that different samples, multiple comparisons through applying suitable method should be used in order to illustrated the probability levels of rejected the statistical hypothesis when it is true, and that could be concluded there is at least within one pair of samples are not equal, and with respect to that we needs to be continuing the test of comparisons by using the Least Significant Difference (LSD) test, which were illustrated in the next table.

Table-2: Multiple Comparison (LSD) among all pairs of Thyroids Function (T3, T4, and TSH) parameters According to different treated samples

Parameters	Groups	No.	Mean	Std. Dev.	Std. Error	95%Confidence Interval for Mean		Min.	Max.
						L. B.	U. B.		
Cholesterol	Healthy	60	180.7	42.7	5.5	169.7	191.7	116	278
	Controlled	40	188.7	50.3	8.0	172.6	204.7	106	295
	Hypothyroidism	57	190.4	41.5	5.5	179.4	201.5	113	302
	Hyperthyroidism	25	157.3	24.2	4.9	147.3	167.3	113	197
Triglycerides	Healthy	60	173.5	99.8	12.9	147.7	199.3	79	609
	Controlled	40	176.3	61.6	9.7	156.6	196.0	97	325
	Hypothyroidism	57	166.6	40.9	5.4	155.8	177.5	77	327
	Hyperthyroidism	25	149.4	41.0	8.2	132.5	166.4	96	259
HDL	Healthy	58	55.8	23.3	3.1	49.7	61.9	21	125
	Controlled	40	51.2	20.8	3.3	44.6	57.9	26	118
	Hypothyroidism	55	44.9	15.9	2.1	40.6	49.2	24	98
	Hyperthyroidism	25	41.2	13.5	2.7	35.7	46.8	18	77
LDL	Healthy	58	88.8	40.1	5.3	78.2	99.3	13.8	193.6
	Controlled	40	101.7	43.0	6.8	87.9	115.4	31.4	187.4
	Hypothyroidism	55	112.7	41.9	5.6	101.4	124.0	20.8	208
	Hyperthyroidism	25	87.3	21.8	4.4	78.3	96.3	40	130
VLDL	Healthy	58	34.7	20.1	2.6	29.4	40.0	15.8	121.8
	Controlled	40	34.8	11.7	1.9	31.1	38.5	19.4	65.0
	Hypothyroidism	55	33.4	8.2	1.1	31.2	35.6	15.4	65.4
	Hyperthyroidism	25	29.1	7.8	1.6	25.9	32.3	15.4	49.2

Showed the summary statistics of different Lipids Profiles parameters readings at different of the studied samples. Relative to subject of BMI parameter, which indicating that the most of the studied individuals having discerned too highly increases in their body's weights, the results indicated that Lipid Profiles parameters had reported dissent in somewhere statistics. Cholesterol parameter has reported some of readings at the studied samples full outside standard of normal interval at the two sided however mean value and their

95% confidence interval were reported normal estimates, except at the hyperthyroidism samples, which were registered dissent readings at the downstairs side only. Triglycerides parameter has reported some of readings at the studied samples full outside standard of normal interval at the upstairs side, as well as mean value and their 95% confidence interval were reported normal responding, and at the hyperthyroidism samples, which were registered normal estimate also.

HDL parameter has reported some of readings at the studied samples full outside standard of normal interval at the two side, as well as mean value and their 95% confidence interval were reported normal estimates, except at the hyperthyroidism sample, which were registered abnormal estimate at the lower bound of the confidence interval .LDL parameter has reported some of readings at the studied samples full outside standard of normal interval at the two side, as well as mean value and their 95% confidence interval were reported normal responding, except at the healthy, controlled, and hyperthyroidism samples, which were registered abnormal responding at the lower bound of the confidence interval estimates. Finally, VLDL parameter has reported some of readings at the studied samples full outside standard of normal interval at the upstairs side, as well as mean value and their 95% confidence interval, which were reported abnormal responding at the upper bound of the confidence interval estimates, except at the hyperthyroidism samples, which were registered normal estimate.

Table-3: One - Way ANOVA for testing equality of Means and Levene Test for equality of variances for Lipid Profile Parameters among the Studied samples

Random Periods	Levene's Test for Equality of Variances		ANOVA for Equality of Means		Comparison Significant(*)
	F- statistics	P-Value	F – statistics	Sig.(2-tailed)	
Cholesterol	4.683	0.004	3.965	0.009	HS
Triglycerides	4.878	0.003	0.901	0.442	NS
HDL	3.414	0.019	4.661	0.004	HS
LDL	3.518	0.016	4.319	0.006	HS
VHDL	4.507	0.005	1.103	0.349	NS

(*) HS: Highly Significant at P< 0.01 ; NS: Non Significant at P>0.05

Showed the results of ANOVA technique for testing equality of mean values of Lipid Profile (Cholesterol, Triglycerides, HDL, LDL, and VHDL). The results showed that there were non-significant were reported with Triglycerides and VLDL parameters among different of the studied samples, rather than violations of the equal variance assumption had been occurred.

Relative to subject of the leftover parameters, highly significant differences were reported at P<0.01, and that result was not enough to reject the statistical hypothesis, which says that the four groups having corresponding proportionally /or whether the different groups were seems to be drown from the same population, and for exploring the nature of real /or actual differences among that different samples, multiple comparisons through applying suitable method should be used in order to illustrate the probability levels of reject the statistical hypothesis when it is true, and that could be concluded there was at least within one pair of samples are not equal, and with respect to that it needs to be continuing the test of comparisons by using the Least Significant Difference (LSD) test, which were illustrated in the next table.

Table-4: Multiple Comparison (LSD) among all pairs of Lipid Profile parameters According to different treated samples

(I) Group	(J) Group	Cholesterol	Triglycerides	HDL	LDL	VLDL
		P-value(*)	P-value(*)	P-value(*)	P-value(*)	P-value(*)
Healthy	Controlled	0.358	0.841	0.258	0.113	0.979
	Hypothyroidism	0.214	0.598	0.003	0.001	0.612
	Hyperthyroidism	0.021	0.151	0.002	0.878	0.092
Controlled	Hypothyroidism	0.837	0.502	0.117	0.179	0.628
	Hyperthyroidism	0.004	0.133	0.045	0.155	0.109
Hypothyroidism	Hyperthyroidism	0.001	0.307	0.440	0.008	0.201

(*) HS: Highly Significant at P< 0.01; NS: Non-Significant at P>0.05

Regarding to the subjects of Cholesterol parameter, the results of the shaded cells exploring significant different at (P<0.01) between (healthy, hypothyroidism), and (healthy, and hyperthyroidism) samples, and significant different at(P<0.05) between (controlled, and hyperthyroidism) samples, while the leftover were reported non-significant differences. Triglycerides parameter, the results were exploring a non-significant different among all multiple comparisons. Relative to subject of HDL parameter, the results of the shaded cells exploring significant different at (P<0.01) between (healthy, hypothyroidism), and (healthy, and hyperthyroidism) samples, and significant different at(P<0.05) between (controlled, and hyperthyroidism) samples, while the leftover were reported non-significant differences.

Regarding to the subjects of LDL parameter, the results of the shaded cells exploring significant different at (P<0.01) between (healthy, hypothyroidism), (hypothyroidism, hyperthyroidism) samples, while the leftover were reported non-significant differences. With respect to the subjects of VLDL parameter, the results were exploring non-significant different among all multiple comparisons

Lipid profile in healthy and thyroid patients

The results in figure-1 declared that normal levels of cholesterol were recorded in healthy, controlled and hypothyroidism groups mean value (180.7 mg/dl), (188.7 mg/dl) and (190.4 mg/dl) respectively, while lower cholesterol levels were recorded in hyperthyroidism group mean value (157.3 mg/dl).

Normal triglycerides levels were recorded in both healthy and thyroid patients with mean value (173.5 mg/dl) in healthy group , (176.3 mg/dl) in controlled group , (166.6 mg/ dl) in hypothyroidism group and (149.4 mg/dl) in hyperthyroidism group.

High density lipoprotein (HDL) results showed that the normal mean values were recorded in healthy (55.8 mg/dl) and controlled (51.2 mg/dl) groups higher than that were recorded in hypothyroidism (44.9 mg/dl) and (41.2 mg/dl) in hyperthyroid groups .

Low density lipoprotein (LDL) results recorded normal value in both healthy (88.8 mg/dl) group and thyroid patients groups : (101.7 mg/dl) in controlled , (112.7 mg/dl) in hypothyroidism and (87.3 mg/dl) in hyperthyroidism.Very low density lipoprotein (34.72 mg/dl) group and in thyroid patients groups : (34.80 mg/dl) in controlled ,(33.40 mg/dl) in hypothyroidism and (29.11 mg/dl) in hyperthyroidism.

Cholesterol and triglycerides are the major circulating lipids which are water insoluble, so that they can not be transferred throughout blood stream as individuals molecules; a large spherical particles called lipoproteins package them into a core surrounded by a shell of water -soluble proteins and phospholipids so that , lipoproteins serve as vehicles to transport cholesterol and triglycerides from one part to another in human body[15].

According to the lipid profile of healthy and patients included in the study, statistical analysis showed that were significant differences at $p < 0.01$ between (controlled and hyperthyroidism), (hyperthyroidism and hypothyroidism) and significant differences at $p < 0.05$ between (healthy and hyperthyroidism) according to cholesterol levels. As well as significant differences at $p < 0.01$ between (healthy and hypothyroidism), (healthy and hyperthyroidism) and significant differences at $p < 0.05$ between (controlled and hyperthyroidism) according to HDL levels and there were significant differences at $p< 0.01$ between (healthy and hypothyroidism), (hypothyroidism and hyperthyroidism) according to LDL levels .

Thyroid diseases are associated with various metabolic abnormalities due to the effect of thyroid hormones on the major metabolic pathways [16]. The explanation of thyroid hormones affected on lipid metabolism is that thyroid hormone regulates the activity of some key enzymes in lipoproteins transport and ,therefore, alter the lipoprotein levels in hypothyroid patients [18].

Results of the present study were closed to those in [16] and [17] who recorded significant differences among the low density lipoprotein (LDL) levels in both hyperthyroidism and hypothyroidism groups of patients .

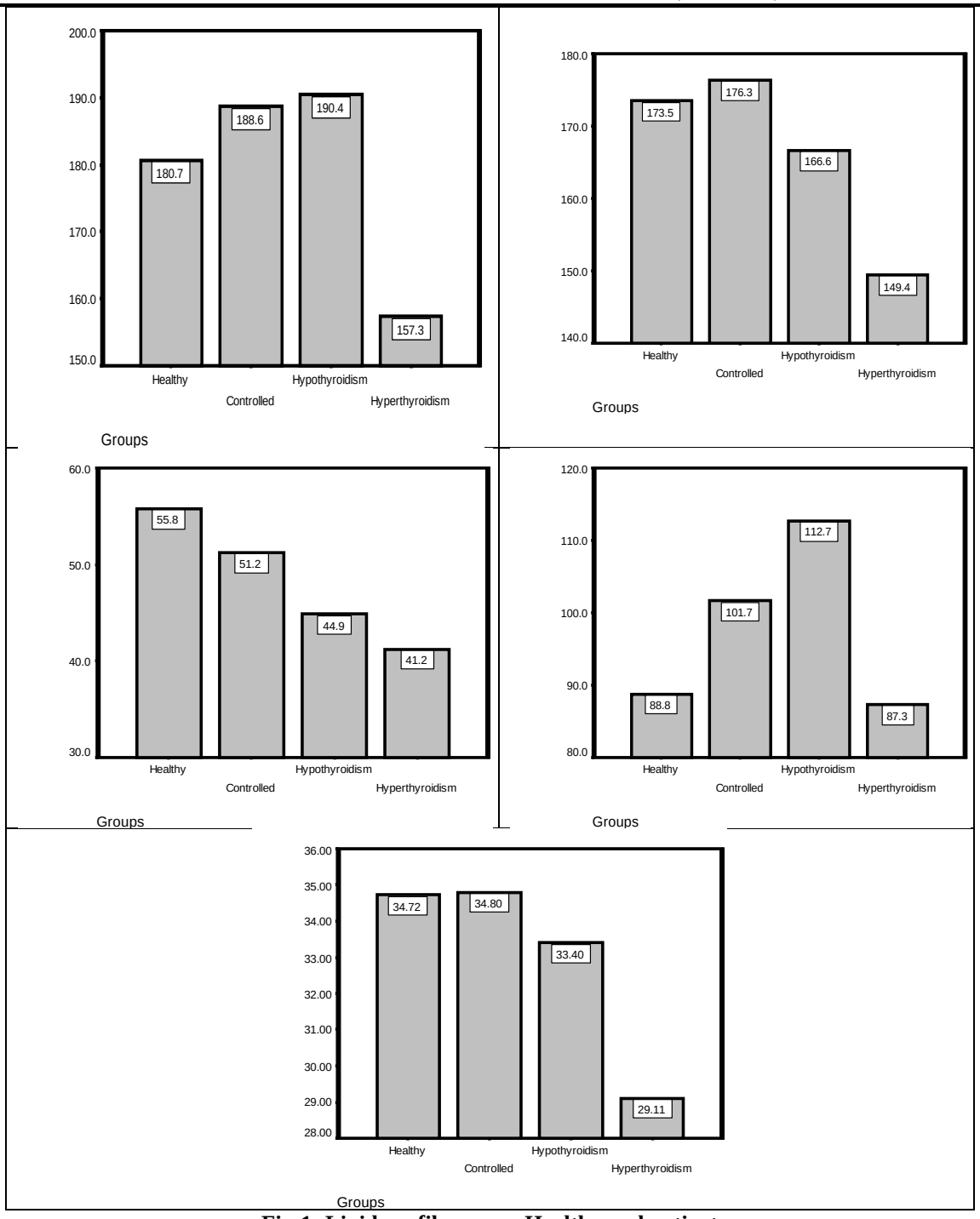

Fig-1: Lipid profile among Healthy and patient group

REFERENCES

1. Karnath, B. M., & Hussain, N. (2006). Signs and symptoms of thyroid dysfunction. *Rev. Physiol. Biochem Pharmacol*, 43-48.
2. Swain, M., Swian, T., & Mohanty, B. K. (2005). Autoimmune thyroid disorders. *Indian J. Clin.Biochem, 20* (1), 9-17.
3. Lazurova, I., & Benhatchi, K. (2012).Autoimmune thyroid disease and non-organ specific autoimmunity. *Polskie.Med. J, 122* (1).
4. Carayon, P., Niccoli-Sire, P., & Lejeune, P.J. (2002). Recommendation consensus diagnostic surveillance des maladies de la gland thyroid. *Biol. Clin. mai-Juin. 60*(3).
5. Young,D.S.(2000).Effects of drugs on clinical laboratory tests, 5thed. AACC Press.
6. Tietz, N. W. (1995). *Clinical guide to laboratory tests*. WB Saunders Co.
7. Friedewald, W. T., Levy, R. I., & Fredrickson, D. S. (1972). Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without

use of the preparative ultracentrifuge. *Clinical chemistry*, *18*(6), 499-502.

8. Wilson, P.W., Abbott, R.D., Garrison, R.J. and Castelli, W.P. (1981). Estimation of Very –Low Density Lipoprotein Cholesterol from data on triglycerides concentration in plasma .*Clin Chem J*. (12), 2008-2010.
9. Vander, M.P. (2013). The epidemiology of thyroid disease. *Br. Med. Bull*, 99, 39–51.
10. Darwish, A. H., Al Sindi, K. A., El Kafsi, J., & BAcantab, M. B. B. S. (2006). Pattern of thyroid diseases-A Histopathological Study. *Bahrain Medical Bulletin*, *28*(4), 1-6.
11. Al-Shaibani, A. B., Al-A'araji, S. B., & Al-Mofarji, S. T. Studying Association between Thyroid Disorders and Helicobacter pylori infection in Iraqi Patients.
12. Bülow Pedersen, I., Knudsen, N., Jørgensen, T., Perrild, H., Ovesen, L., & Laurberg, P. (2002). Large differences in incidences of overt hyper-and hypothyroidism associated with a small difference in iodine intake: a prospective comparative register-based population survey. *The Journal of Clinical Endocrinology & Metabolism*, *87*(10), 4462-4469.
13. Al-Shaibani, A. B., Al-A'araji, S. B., & Al-Mofarji, S. T. Studying Association between Thyroid Disorders and Helicobacter pylori infection in Iraqi Patients.
14. Mittal, A., Sathian, B., Kumar, A., Chandrasekharan, N., & Dwedi, S. (2010). The Clinical implications of thyroid hormones and its association with lipid profile: A comparative study from western Nepal. *Nepal Journal of Epidemiology*, *1*(1), 11-16.
15. Haukim, N., Bidwell, J. L., Smith, A. J. P., Keen, L. J., Gallagher, G., Kimberly, R., ... & Pociot, F. (2002). Cytokine gene polymorphism in human disease: on-line databases, supplement 2. *Genes and immunity*, *3*(6), 313-330.
16. Peppa, M., Betsi, G., & Dimitriadis, G. (2011). Lipid abnormalities and cardiometabolic risk in patients with overt and subclinical thyroid disease. *Journal of lipids*, *2011*.
17. Saini, V., Yadav, M. A., Arora, S., Singh, R., & Bhattacharjee, J. (2012). Association between different degrees of hypothyroidism and serum lipids. *Internet Journal of Medical Update-EJOURNAL*, *7*(2).