EFFECT OF HYPOTHYROIDISM ON LIPID PROFILE IN ASYMPTOMATIC NEWLY DIAGNOSED PATIENTS

MOHSIN SHAFI,[1] WAQAR AZIM[2] AND M. ASIF NAWAZ[1]
[1]*Department of Pathology, Army Medical College, Rawalpindi and National University of Science and Technology (NUST), Islamabad and* [2]*Combined Military Hospital (CMH), Lahore*

ABSTRACT

Introduction: Hypothyroidism is a very common endocrine problem. It can be either overt or subclinical. Subclinical hypothyroidism predisposes to overt hypothyroidism. Hypothyroidism leads to hypercholesterolaemia because of reduced activity of lipoprotein lipase and thus increases the cardiovascular risk. The objective of this study was carried out to find the lipid profile in hypothyroid patients in asymptomatic previously undiagnosed cases and to correlate different components of lipid profile with TSH and fT_4.

Materials and Methods: This is a case control study consisting of 82 hypothyroid patients with age and gender matched controls selected through convenient sampling from Chemical Pathology Department, Army Medical College, Rawalpindi and National University of Sciences and Technology (NUST), Islamabad between May and October 2012. Data were recorded using specially designed pro forma and analysis was carried out on SPSS 17.

Results: Among the 82 hypothyroid patients, 62 were females while 20 were males. Mean age of patients was 40.6 ± 11.7 years. Hypothyroid patients showed a dyslipidaemic picture and all the components namely total cholesterol, triglycerides, low density lipoprotein and high density lipoprotein were significantly raised when compared with the controls. TSH showed significant positive correlation (p value) with total cholesterol, low density lipoprotein and high density lipoprotein.

Conclusion: Hypothyroid patients show a dyslipidaemic picture, thus increasing the risk for cardiovascular complications. A hypothyroid patient must be screened for lipid abnormalities, while in case of unexplained hyperlipidemia, thyroid screening must be performed.

Key Words: Hypothyroidism, dyslipidaemia, hyperlipidaemia, cardiovascular complications.

INTRODUCTION

Thyroid problems are one of the most common endocrine problems encountered in laboratory and clinical practice. Thyroid hormones are important regulators of many metabolic processes through their effect on protein, carbohydrate and lipid metabolism and also affect the basal metabolic rate. They have significant effect on synthesis, mobilisation and metabolism of lipids. Hypothyroidism means underfunctioning of the thyroid gland while the over-functioning of thyroid gland is known as hyperthyroidism. In our country, hypothyroidism is more prevalent and incidence of hypothyroidism is twice to that of hyperthyroidism.[1] Hypothyroidism is associated goiter, ataxia, weight gain, slow reflexes, bradycardia, myxedema, dry scaly skin, fatigue, lethargy, weakness, brittle nails, cold intolerance, hair loss, constipation, decreased sweating, paraesthesias and hoarseness. In hypothyroidism there is hypercholesterolemia due to reduced catabolism of lipoprotein, which can be explained by hormone deficit and decreased activity of lipoprotein lipase.[2] It is also associated with dyslipedaemia which increases the risk of endothelial dysfunction, hypertension and cardiovascular diseases.[3] Hypothyroidism can either be overt or subclinical. Overt hypothyroidism means that there is a deficiency of thyroid hormones which results in the elevation of thyroid stimulating hormones (TSH) while in subclinical hypothyroidism, TSH is elevated but the thyroid hormones are within normal limits. Subclinical hypothyroidism predisposes to overt hypothyroidism. Lipid abnormalities are reported to be more common in patients with overt hypothyroidism and are thought to contribute to the increase in cardiovascular risk laboratory finding, particularly in the early detection of thyroid dysfunction.[4] Even mild elevations of TSH are associated with changes in lipid profile significantly enough to raise the cardiovascular risk.[5] This study was carried out to find out the levels of lipid profile in hypothyroid patients and to see the correlation of different components of lipid profile with TSH and fT_4.

MATERIAL AND METHODS

The study was performed in chemical pathology department, Army Medical College, Rawalpindi from May to Oct. 2012. It was a case control study which was carried on both sexes. A total of 82 hypothyroid patients with age and gender matched controls were recruited using convenience sampling technique. Subjects reporting to chemical pathology department, having TSH above 4.5 mIU/L (hypothyroid), who were previously undiagnosed and asymptomatic and those who consented were included in the study as the cases. Subjects taking the drugs affecting the thyroid function (antithyroid drugs, oral contraceptives, thyroid replacement therapy, oestrogens, steroids, anti-epileptic drugs), lipid lowering drugs, pregnant women and infants were excluded as cases from the study. Healthy age and gender matched controls having TSH between 0.4 – 4.5 mIU/L (euthyroid) with no acute or chronic illness, on anti inflammatory drugs, pregnant women or women using oral contraceptive pills were excluded as controls. Before sample collection consent, detailed history and complete general physical and thyroid examination was done. Five ml of blood was drawn through venipuncture and was transferred to a plain vacutainer tube. Serum TSH and fT_4 were analysed on fully automated immunoassay system (Access – II, Beckman Coulter) based on principle of chemiluminiscence immunoassay. Lipid profile included measurement of total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL) and triglycerides (TG). TC, TG and HDL were measured by enzymatic colorimetric kits on a fully automated chemical pathology analyser (Selectra E). LDL (mm-ol/L) was calculated using Friedewalds formula: (TC) – (HDL) – (TG) / 2.2. Data were recorded using specially designed proformas and results were analysed using SPSS version 17.

Table 1: *Comparison of different parameters between cases and controls.*

Parameters	*Cases (Mean ± SD)*	*Controls (Mean ± SD)*	*P-value*
TSH (mlU/L)	14.3 ± 10.1	1.8 ± 0.7	< 0.001
fT_4 (pmol/L)	8.98 ± 3.2	13.2 ± 10.8	< 0.001
TC (mmol/L)	5.56 ± 1.13	3.40 ± 1.83	< 0.001
TG (mmol/L)	1.81 ± 0.86	0.94 ± 0.24	< 0.001
HDL (mmol/L)	1.13 ± 0.20	0.96 ± 0.15	< 0.001
LDL (mmol/L)	3.59 ± 0.95	2.45 ± 0.60	< 0.001

Table 2: *Correlation between TSH and fT_4 with other parameters (n = 82).*

Parameter		*Correlation with TSH*	*Correlation with fT^4*
TC	Correlation Coefficient	.302**	.267*
	Sig (2 – tailed)	.006	.015
TG	Correlation Coefficient	0.037	.125
	Sig (2 – tailed)	.740	.265
HDL	Correlation Coefficient	.383**	-.367**
	Sig (2 – tailed)	.000	.001
LDL	Correlation Coefficient	.267*	-.271*
	Sig (2 – tailed)	.015	.014

**.Correlation is significant at the 0.01 level (2 – tailed).
*.Correlation is significant at the 0.05 level (2 – tailed).

RESULTS

A total of 82 patients were included in the study which consisted of 31 (37.8%) cases of overt hypothyroidism while 52 (62.2%) cases of subclinical hypothyroidism. There were 62 females and 20 male subjects in the cases while the controls consisted of 65 females and 17 males. Female to male ratio in cases was 3.1:1. Mean age of the cases was 40.6 ± 11.7 years while in controls it was 41.2 ± 11.9. Mean of TSH was found to be 14.3 ± 10.1 mIU/L in cases, while in controls it was 1.8 ± 0.7 mIU/L, fT_4 was found to be 8.98 ± 3.2 pmol/L and 13.2 ± 10.8 pmol/L in controls. In lipid profile, mean of TC was 5.56 ± 1.13 mmol/L in cases while it was 3.40 ± 1.83 mmol/L in controls, while that of TG's was 1.81 ± 0.86 mmol/L in cases while it was 0.94 ± 0.24 mmol/L, LDL was 3.59 ± 0.95 mmol/L in cases and 2.45 ± 0.60 mmol/L in controls and that of HDL was 1.13 ± 0.20 mmol/L in cases while it was 0.96 ± 0.15 mmol/L (Table 1). Independent sample T test was used to compare TC, LDL and HDL amongst cases and controls and they showed a p-value of < 0.001 while Mann Whitney U test was used to compare TSH, fT_4 and TG in cases and controls and they showed a p-value of < 0.001 (Table 1). Boxplot comparing the values of TC in controls and cases is shown in Fig. 1. Correlation studies were carried out in cases which showed a statistically significant positive correlation of TSH with TC, HDL and LDL and a negative significant correlation with fT_4 while it didn't show any correlation with TG (Table 2). Scatter plot

showing correlation of TSH with TC is shown in Fig. 2.

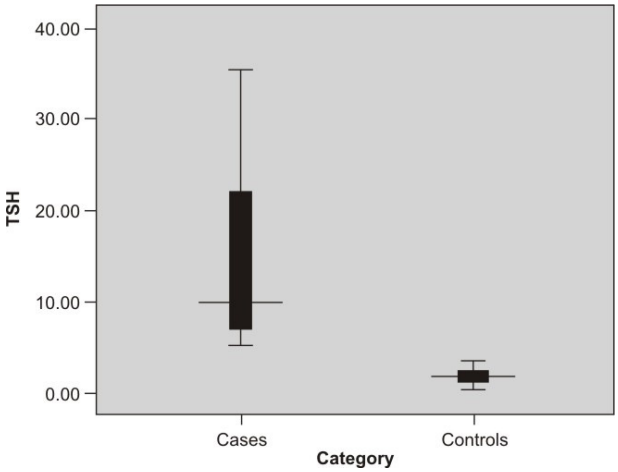

Fig. 1: *Boxplot comparing TSH in cases and controls.*

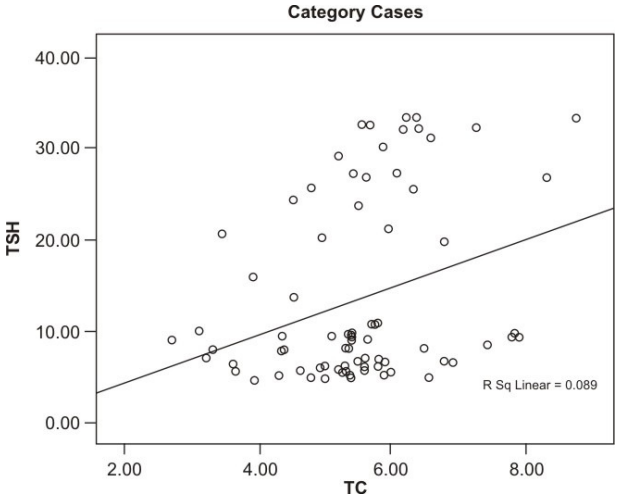

Fig. 2: *Scatterplot showing correlation of TSH with TC (p-value 0.006).*

DISCUSSION

In this study, the hypothyroidism was predominantly present in females with a female to male ratio of 3.1:1 which is quite similar to 4:1 ratio quoted by Shaikh et al in 2009.[1]

The hypothyroid patients presented a dyslipidemic picture with an increase in TC, TG, LDL-c and HDL levels when compared with controls. TC was found to be 5.56 ± 1.13 mmol/L in cases while it was 3.40 ± 1.83 mmol/L in controls, with a p-value of < 0.001. LDL-c was also found to be significantly raised in hypothyroid patients (3.59 ± 0.95 mmol/L) when compared with controls (2.45 ± 0.60 mmol/L). This increase in TC and LDL-c is in a accordance with many studies.[6,7] This increase is usually attributed to the decreased activity of lipoprotein lipase and HMG – CoA reductase.

TG was also found to be significantly raised in hypothyroid patients (3.40 ± 1.83 mmol/L) when compared with controls (0.94 ± 0.24 mmol/L) with a p-value of < 0.001. Many studies show similar results.[8,9] TG's are usually increased in hypothyroid patients because of decreased activity of lipoprotein lipase which in turns results in decreased clearance of TG rich lipoproteins.

HDL was also found to be statistically significantly raised in hypothyroid patients (1.13 ± 0.20 mmol/L) when compared with controls (0.96 ± 0.60 mmol/L). This result is similar to some studies.[10] This increase of HDL in hypothyroidism can be due to the less activity of cholesteryl ester transfer protein and hepatic lipase (Tan et al, 1998).[11]

It was ***concluded*** that patients with hypothyroidism will present a dyslipidaemic picture and thus will increase the risk of cardiovascular complications. Therefore, it is recommended that any patient with thyroid dysfunction especially hypothyroidism should be screened for lipid abnormalities and treated at the earliest. While in any case of unexplained hyperlipdemia, thyroid screening must be done.

REFERENCES

1. Shaikh BA, Soomro AA, Soomro MA, Pirzado ZA, Solangi GA, Abro HA, et al. Lipid profile in primary hypothyroidism, at Chandka Medical College, Larkana. Medical Channel, 2009; 15 (4): 15-18.
2. Parkash A and Lal AK. Serum lipids in hypothyroidism: our experience. Indian Journal of Clinical Biochemistry, 2006; 21 (2): 153-55.
3. Pucci E, Chiovalto L and Pinchera A. Thyroid and lipid metabolism. Int'l J Obesity, 2004; 24: 109-12.
4. Morris MS, Bostom AG, Jacques PF, Selhub J and Rosenberg IH. Hyperhomocysteinemia and hypercholesterolemia associated with hypothyroidism in the third US National Health and Nutrition Examination Study. Atherosclerosis, 2001; 155: 195-200.
5. Serter K, Dermirbas B, Culha C and Cakal E. The effect of L-thyroxine replacement therapy on lipid based cardiovascular risk in subclinical hypothyroidism. Invest J Endocrinol, 2004; 27: 897-903.
6. Abbas JM, Chakraborty J, Akanji AO and Doi SA. Hypothyroidism results in small dense LDL independent of IRS traits and hypertrilyceridemia. Endocr J., 2008; 55: 381-9.
7. Pearce EN, Wilson PW, Yang Q, Vasan RS and Braverman LE. Thyroid function and lipid subparticle sizes in patients with shortterm hypothyroidism and a population – based cohort J Clin Endocrinol Metab., 2008; 93: 888-94.
8. Toruner F, Altinova AE, Karakoc A, et al. Risk factors for cardiovascular disease in patients with subclinical hypothyroidism. Adv Ther., 2008; 25: 430-7.
9. Milions HJ, Tambaki AP, Kanioglou CN, Elisaf MS, Tselepis AD and Tsatsoulis A. Thyroid substitution therapy induces high – density lipoprotein – associated platelet – activating factor – acetylhydrolase in

patients with subclinical hypothyroidism: a potential antiatherogenic effect. Thyroid, 2005; 15: 455-60.
10. Regmi A, Shah B, Rai BR and Pandeya A. Serum lipid profile in patients with thyroid disorders in central Nepal. Nepal Med Coll J., 2010; 12 (4): 253-256.
11. Tan KCB, Shiu SWM and Kung AWC. Plasma cholesteryl ester transfer protein activity in hyper- and hypothyroidism. J Clin Endocrinol Metabol., 1998; 83: 149-153.