Total antioxidant status and serum lipid profile in hypothyroid patients in tertiary care hospital of Northern India

Amandeep Kaur[1,*], Jaskiran Kaur[2], Sahiba Kukreja[3], Anju Sharma[4], Neha[5]

[1,4]Assistant Professor, [2,5]Associate Professor, [3]Professor & Head, Dept. of Biochemistry, Sri Guru Ram Das Institute of Medical Sciences & Research, Amritsar

***Corresponding Author:**
Email: amandeepbest@gmail.com

Abstract

Objective: To study the Total Antioxidant status, thyroid profile and lipid profile in patients of overt and subclinical hypothyroidism. Also to assess the sex differences in thyroid function and to compare our results to previously published reference data.

Results: In the present study 93.3% cases were females, suggesting hypothyroidism is more prevalent in the female population. The TAS levels were decreased in 20 cases(66.7%) and 1 control(5%). The difference was statistically highly significant ($p<0.001$).

Conclusion: The study indicates that monitoring of lipid levels in patients with thyroid dysfunction would be helpful in preventing cardiovascular diseases. Also it may be a good practice to correct the state of impaired anti-oxidant balance with antioxidant replacement therapy.

Keywords: TAS(Total antioxidant status), Lipid profile, Oxidative stress, Hypothyroidism

Access this article online	
Quick Response Code:	Website: www.innovativepublication.com
	DOI: 10.5958/2394-6377.2016.00050.2

Introduction

Endocrine diseases are increasing worldwide. Thyroid disorders other than iodine deficiency disorders in the form of thyroiditis, hypothyroidism or autoimmune thyroid dysfunctions are on rise. The thyroid gland secretes the thyroid hormones, thyroxine (T4) and the more biologically active form triiodothyroxine (T3). Thyroid disease is being increasingly diagnosed with greater awareness and is one of the chronic non-communicable disease affecting women more though male population is not spared of the ailment. It is estimated that about 200 million people are at the risk of iodine deficiency diseases in our country.[1] It is known that overt hypothyroidism leads to an increase in plasma cholesterol levels.[2] There are studies which show that hypothyroidism is associated with dyslipidemia which increase the risk of endothelial dysfunction, hypertension and cardiovascular diseases.[3] This study was proposed to understand the antioxidant status of hypothyroid population attending the OPD of a tertiary care hospital of Northern India and to find out if dyslipidemia occurs in these patients.

Material and Method

This study was done in the department of Biochemistry of the institute. 30 cases in the age group of 25-40 years of either sex selected in the study were newly diagnosed with hypothyroidism not on treatment. A group of 20 normal individuals, age and sex matched from the same population served as controls. Patients with an active infection, history of current smoking, diabetes, malignancy, pituitary and rheumatologic disease and usage of drugs that affect the oxidant state and lipid parameters were excluded. The cases were identified by measuring the thyroid stimulating hormone (TSH) concentration in serum, which should be above the reference range of 0.46-4.68 mIU/L. Table 1 Further serum FT4 may or may not be decreased; these thyroid disorders are known as overt (OH) and subclinical hypothyroidism (SCH), respectively. Informed consent was obtained from all the subjects.

Blood sample and preparation: Taking all aseptic and antiseptic precautions 5ml of blood was drawn from the median cubital vein. The blood is collected 12 to 14 hours after the last meal i.e. fasting blood sample is used for all the investigations. Serum was separated and sent to the laboratory immediately for biochemical determination of TAS (Total antioxidant status) which was measured with TAS kit (Randox Laboratories limited, Crumlin, UK) and expressed as mmol/l. Ultrasensitive TSH, FT4 and T3 were measured with vitros Eci analyzer based on chemiluminescence technology (Ortho-clinical Diagnostics Rochester, NY, USA) using a test kit of the same manufacturer. Lipid profile (Cholesterol, LDL-C, HDL-C, TG and VLDL) were measured by Siemens Dimension RxL max and reagents by Siemens Healthcare Diagnostics were used.

The project was approved by the institutional ethics committee.

Statistics

The association between the various parameters in different groups was evaluated using Pearson's correlation coefficient. $p<0.05$ was considered statistically significant. All the data/tables were prepared using Microsoft Excel 2007.

Results

The statistical analysis showed sex and number distribution in cases and controls were comparable. In the present study, majority of the subjects i.e. 28/30 cases (93.3%) and 13/20 controls (65%) were females. These findings suggest that hypothyroidism is much more prevalent in the female population. According to Sharma P et al[4], Vanderpump MPJ[5]; thyroid disease is much more prevalent in women than in men. **Table 2**

In the present study, we have addressed the possible linkage among thyroid profile, TAS and lipid profile in subclinical and overt hypothyroid patients and their comparison with healthy population. Serum TAS levels were **decreased** in 20/30 cases (66.7%) and only 1/20 control (5%) showed **decrease** in its levels. The difference was statistically highly significant ($p<0.001$). **Table 3**

The levels of S. Cholesterol, TG, VLDL-C, and LDL-C were elevated in 23.3%, 43.3%, 23.3% and 56.7% of cases respectively when compared with controls. It was observed that the statistical difference of these parameters among cases and controls was non-significant. **Table 3**

The levels of S.HDL-C were lowered in 46.7% cases and elevated in 6.7% cases. In controls, the levels of S.HDL-C were similar to cases i.e. 50% have lower value and 10% have higher value than normal reference value. The difference was statistically non-significant. **Table 4**

Table 1: Reference Range

TSH	0.46-4.68	mIU/L
FT4	0.78-2.19	ng/dl
T3	0.97-1.69	ng/ml

Table 2: Showing sex and number distribution in controls and study group

Sex	Cases	Controls	Total
Male	2 (6.7%)	7 (35%)	9
Female	28 (93.3%)	13 (65%)	41
Total	30	20	50

$x^2 = 6.527$; df = 1; p=0.011; Significant

Table 3: Showing TAS (Total Antioxidant status) in controls and study group

TAS	Cases	Controls	Total
Normal	10 (33.3%)	19 (95%)	29
Abnormal (**Decrease**)	20 (66.7%)	1 (5%)	21
Total	30	20	50

$x^2 = 18.733$; df = 1; p <0.001; Highly Significant

Table 4: Association of TAS with various variables

			TAS
Cases	T3	r=	0.106
		p=	0.576
	FT4	r=	-0.073
		p=	0.700
	TSH	r=	0.047
		p=	0.804
	CHOL	r=	0.191
		p=	0.312
	TG	r=	0.080
		p=	0.674
	HDL	r=	-0.149
		p=	0.431
	LDL	r=	0.160
		p=	0.398
	VLDL	r=	0.069
		p=	0.717
Controls	T3	r=	-0.326
		p=	0.160
	FT4	r=	0.395
		p=	0.084
	TSH	r=	-0.338
		p=	0.145
	CHOL	r=	-0.042
		p=	0.862
	TG	r=	-0.010
		p=	0.965
	HDL	r=	-0.310
		p=	0.183
	LDL	r=	0.254
		p=	0.279
	VLDL	r=	-0.065
		p=	0.785

p <0.001; Highly Significant

No significant correlation among TAS with any variable.

Discussion

It has been generally accepted that the dynamic equilibrium between pro-oxidants and anti-oxidants in a certain milieu is better reflected by TAS determination than by the determination of each individual antioxidant component.[6]

In our study, we estimated serum TAS levels in patients of subclinical and overt hypothyroidism which

may be more informative about overall antioxidant defences. The mean serum TAS levels in cases were **decreased** as compared to controls, and **the difference was statistically significant**. It appears that alteration in the antioxidant system is **one of the involved factor in increased** oxidative stress in these patients. Our findings are in accordance with the study by Konukoglu et al[7] who found that levels of the antioxidant plasma protein thiol decreased in hypothyroid patients which suggested it may be leading factor in increased oxidative stress in overt hypothyroidism.

The effect of overt hypothyroidism on lipid metabolism is another debated issue. Thyroid hormones are important modulator of intermediary metabolism. They affect synthesis, mobilisation and degradation of lipids, although degradation is more influenced than the synthesis. In our study, serum Cholesterol, LDL-C levels were elevated in cases when compared with the controls which correspond with several studies.[8,9,10] The reason for these findings could be due to decreased fractional clearance of LDL by a reduced number of LDL- receptors in the liver.[11] Also it is cleared less efficiently from the circulation due to a decreased T3 dependent gene expression of the hepatic LDL-receptor.[4]

Overt hypothyroidism is known to increase HDL-C levels, but we found HDL-C levels in cases were similar to levels in controls. The reason for this may be that it may take longer for overt hypothyroidism to affect the HDL-C levels. This finding was in accordance with Torun AN et al study.[12]

Conclusion

In conclusion we found an increased oxidative stress in cases. However, the antioxidant system is likely to be affect in these patients. Our findings may contribute additional information to the literature in which a firm conclusion has yet to be made about oxidative stress in subclinical and overt hypothyroid patients. This study has also demonstrated and proved that hypothyroidism also causes dyslipidemia. These patients should be screened for the evidence of metabolic syndrome. By doing so, we can prevent various complications like hypertension, insulin resistance, oxidative stress etc. of metabolic syndrome. However more studies needs to be done to elucidate the real significance of oxidative stress and dyslipidemia in subclinical and overt hypothyroidism.

References

1. Shah SN, Joshi SR. Thyroid as an endocrine organ. Journal of association of physicians of India. 2000;48(1):7-8.
2. Maratou E, Hadjidakis DJ, Kollias A, Tsegka K, Peppa M, Alevizaki M, et al. Studies of insulin resistance in patients with clinical and subclinical hypothyroidism. Eur J Endocrinol. 2009.160(5):785-90.
3. Pucci E, Chiovalto L, Pinchera A. Thyroid and lipid metabolism. Int'l J obesity. 2004;24:109-12.
4. Sharma P, Patgiri D, Goyal S, Sharma G, Pathak MS. Hypothyroidism causing dyslipidemia in both subclinical & overt hypothyroidism. Indian Journal of Basic & Applied Medical Research. June 2013;2(7):779-88.
5. Vanderpump MPJ. The epidemiology of thyroid diseases. In: Braverman LE, Utiger RD, editors. Werner and Ingbar's The Thyroid: A Fundamental and Clinical Text. 9th edn. Philadelphia: JB Lippincott-Raven;2005:398-496.
6. Ghiselli A, Serafini M, Natella F, Scaccini C. Total antioxidant capacity as a tool to assess redox status: Critical view and experimental data. Free Rad Biol Med. 2000;29:1106-14.
7. Konukoglu D, Ercan M and Hatemi H. Plasma viscosity in female patients with hypothyroidism: effects of oxidative stress and cholesterol. Clinical Hemorheology and Microcirculation. 2002;27:107-13.
8. Epstein AA and Lande H. Studies on blood lipoids. The relation of cholesterol and protein deficiency to basal metabolism. Archives of Internal Medicine. 1922;30:563-77.
9. Mason RL, Hunt HM and Hurxthal L. Blood cholesterol values in hyperthyroidism and hypothyroidism – their significance. New England Journal of Medicine. 1930;203:1273-8.
10. Peters JP and Man EB. The interrelations of serum lipids in patients with thyroid disease. Journal of Clinical Investigation. 1943;22:715-20.
11. Regmi A, Shah B, Rai BR, Pandeya A. Serum lipid profile in patients with thyroid disordersin Central Nepal. Nepal Med Coll J. 2010;12(4):253-6.
12. Torun AN, Kulaksizoglu S, Kulaksizoglu M, Pamuk BO, Isbilen E and Tutuncu NB. Serum total antioxidant status and lipid peroxidation marker malondialdehyde levels in overt and subclinical hypothyroidism. Clinical endocrinology. 2009;70:469-74.