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Original Research Article.

Study of Serum High Sensitive C - Reactive Protein Level in Hyperthyroid Patients

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ABSTRACT

Background: C-reactive protein (CRP) is widely known as sensitive marker of low grade inflammation and a well-known independent predictor for atherosclerosis. Elevated level of thyroid hormones in overt hyperthyroidism leads to hyperdynamic state of cardiovascular system. However, relation between increased thyroid hormones and low grade inflammation is not clear. Therefore the present study was designed to investigate hs-CRP in patients suffering with hyperthyroidism.

Methods: Fifty-three patients with hyperthyroidism and forty-five healthy control subjects of age (40.2 ± 13.6 yrs and 39.8 ± 7.7yrs, p>0.05) and BMI (24.2 ± 4.6 kg/m2 and 23.8 ± 4.3 kg/m2, p>0.05) were included in this study. Serum concentrations of free T4 (fT4), fT3, TSH, and lipid profile total cholesterol, triglyceride, high density lipoprotein-cholesterol (HDL-C), low density lipoprotein-cholesterol (LDL-C) were estimated in all subjects. Serum hs-CRP levels were assessed by ELISA method.

Results: A significant difference between total cholesterol (p< 0.01) and LDL-C levels (p< 0.01) of hyperthyroid group were lower than the control group. There was a significant difference in hs-CRP level between hyperthyroid patients group (0.52± 0.12) and control groups (0.049±0.02). Further, a significant correlation of hs-CRP was observed with FT3, FT4 and TSH (r= 0.298, p<0.01, r= 0.278, p<0.01 and r= -0.235, p<0.01) in hyperthyroid group.

Conclusion: Finding of the present study suggest that hyperthyroidism is associated with low grade inflammation which leads to the development of atherosclerosis. Moreover, hs-CRP can be an important biomarker for the atherosclerosis in hyperthyroid patients.

Keywords: Hyperthyroid, hs-CRP, Atherosclerosis.

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INTRODUCTION

C-reactive protein (CRP) is widely known as sensitive marker of low grade inflammation. Further, CRP is an acute phase reactant; moreover, high sensitive-CRP (hs-CRP) has been found associated with atherosclerosis and various diseases of heart vessels.[1]

Elevated level of thyroid hormones in overt hyperthyroidism leads to hyperdynamic state of cardiovascular system ie increased cardiac output whereas decrease peripheral resistance which in turn escorts higher heart rate, supraventricular tachyarrhythmias along with increased functioning of left ventricle during systole and diastole.[2,3]

However, a strong relation between thyroid hormones and haemodynamics of heart has been established; Nonetheless, relation of higher thyroid hormones and low grade inflammation is not clear. Therefore the present study was designed to investigate the relation of hs- CRP and elevated thyroid hormone in hyperthyroid patients.

MATERIALS AND METHODS

A cross-sectional study was carried out in Department of General Medicine, FH Medical College, Tundla, Firozabad, Uttar Pradesh, India. The present study was approved from ethical committee of institute. Total fifty three patients with hyperthyroidism (27 females & 26 males), without having medical history of any chronic disease e.g. inflammatory disorder, hypertension, diabetes, cardiovascular diseases etc were included in hypertensive patients group for the study. Further, control group included forty five healthy subjects (25 females & 20 males). Thyroid hormones FT3, FT4, TSH, lipid profile total cholesterol (TC), triglycerides (TG), HDL-C, LDL-C serum levels along with inflammatory markers hs- C reactive protein (hs-CRP) and interleukin-6 (IL6) were estimated in all the participants of both groups. Every subject of control group as well patients of hyperthyroid group gave a written consent before participating in the study. Fasting serum sample of both groups were collected to estimate the following

biochemical parameters. Enzyme linked Immunosorbent assay (ELISA) method and kits manufactured by Avantor Performance Materials, India were used to measure Ft3, FT4 and TSH.3 TC, TG, HDL were investigated by CHOD/POD method, GPO-PAP method and CHOD-POD/ Phosphotungstate method respectively whereas, kits manufactured by Erba Mannheim were used. LDL-C was calculated by means of Friedewald formula.[4] Inflammatory marker CRP was estimated by ELISA method and the Kits of Ray Biotech® Inc. was used respectively.[5]

Statistical Analysis

All the results were expressed as Mean ± SD. Unpaired student's t test was used to analyse differences in continues variable between hyperthyroid group and control group. Pearson correlation coefficient test was used to assess correlation between the variables.

A p-value <0.05 was considered statistically significant. IBM SPSS Statistics 21 manufactured by IBM USA was used for entire calculations.

Table 1: Baseline characterstics between hyperthyroid patients and control group.

	Hyperthyroid patients (n=53)	Control group (n=45)	P value
Age (years)	40.2 ± 13.6	39.8 ± 7.7	NS
BMI (kg/m2)	24.2 ± 4.6	23.8 ± 4.3	NS
WHR	0.77 ± 0.26	0.73 ± 0.29	NS
Cholesterol (mg/dl)	154.9 ± 33.6	177.0 ± 25.3	<0.001
Triglyceride (mg/dl)	77.2 ± 28.2	75.1 ± 30.3	NS
HDL-C (mg/dl)	48.3 ± 8.2	50.1 ± 7.8	NS
LDL-C (mg/dl)	90.4 ± 28.6	111.7 ± 22.0	<0.01
Fasting glucose(mg/dl)	95.6 ± 9.5	87.5 ± 8.0	<0.05

NS- non significant, all the results were expressed as mean ± SD. P value <0.05 is statistically significant.

Table 2: Comparison of thyroid hormones and inflammatory markers of hyperthyroid patients and control group.

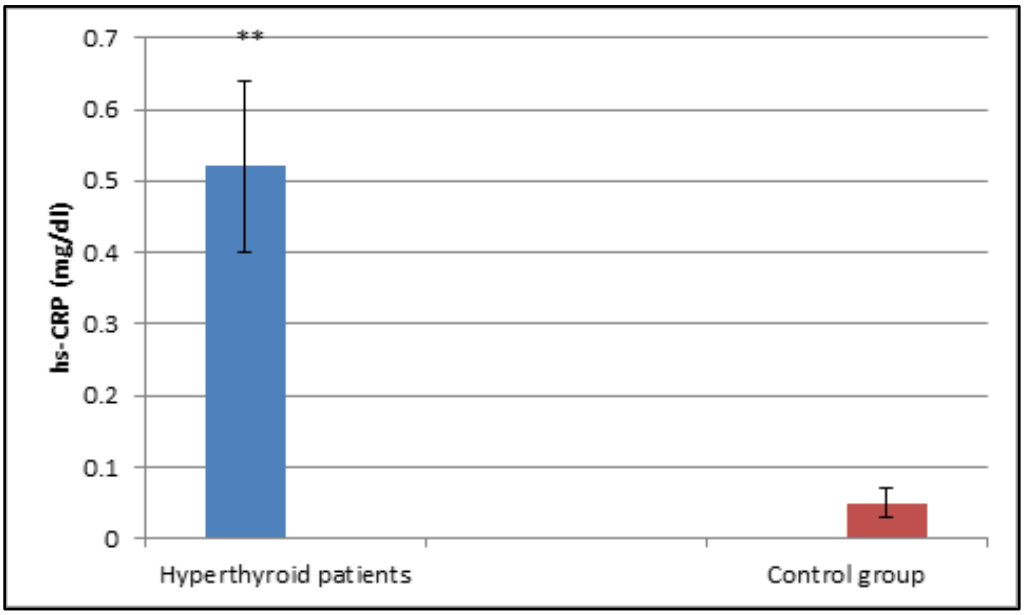
	Hyperthyroid patients (n=53)	Control group (n=45)	P value
fT3 (pg/mL)	12.5 ± 5.9	4.8 ± 0.5	<0.001
fT4 (ng/mL)	5.3 ± 1.6	1.5 ± 0.4	<0.001
TSH (µIU/mL)	0.05 ± 0.02	1.25 ± 0.86	<0.001

NS- non significant, all the results were expressed as mean ± SD. P value <0.05 is statistically significant.

Table 3: Correlation between thyroid hormones and hs-CRP

	r	p
fT3	0.298	<0.01
Ft4	0.278	<0.01
TSH	-0.235	<0.01

Figure 1: Hs-CRP level in both groups.



** = significant (p<0.05)

RESULTS

[Table 1]. Shows the main characteristics of the hyperthyroid patients and control group. There were insignificant differences in age, BMI and WHR of hyperthyroid patients and control group. Further, TC and LDL were significantly lower (17.9 ± 8.3, p<0.001 and 21.3 ± 6.6, p<0.001) in hyperthyroid patients group in comparison of Control group. On the other hand there was no significant difference between triglycerides and HDL of both groups. Fasting glucose level was significantly higher in hyperthyroid group in comparison of control group (p< 0.05). There were significant differences between fT3, fT4 and TSH of hyperthyroid patients and control group. (p< 0.001, p< 0.001 and p< 0.001.) There was a significant difference in hs-CRP level between hyperthyroid patients group (0.52±0.12) and control groups (0.049±0.02) [Figure 1].

[Table 3] shows, Serum fT4 levels were negatively correlated with cholesterol (r= -0.249, p< 0.05) and LDL-C (r= -0.357, p< 0.05) levels. A significant corelation of hs-CRP was observed with FT3, FT4 and TSH (r= 0.298, p<0.01, r= 0.278, p<0.01 and r= -0.235, p<0.01) in hyperthyroid group.

DISCUSSION

Hs-CRP is an important marker of low grade inflammation and it has been found associated with atherosclerosis.[6] However, results of the present study revealed that there was an insignificant level between elevated level of thyroid hormones and hs-CRP. Atherosclerosis is induced by various processes among them inflammation and oxidation of lipids are most important. Low density lipids are oxidised which in turn leads to damage of endothelium; Further, enhanced secretion of chemotactic increased migration of macrophages and platelets into the subendothelial space. Futhermore, these are converted foam rich in LDL-oxide.[7,8]

Further, foam cells interact with T lymphocytes which in turn induce immune response of body result in increased secretion of acute phase reactant and cytokines.[9]

Paraoxynase acts as an antioxidant and decrease the oxidataion of LDL via decreasing the supraoxide redical which is one of the potent oxidants of body. Nontheless increased activity of paraoxynase has been found associated with inhibition of pro-inflammatory responses of endothelium and mecrophages.[10] Moreover, low level of paraoxynase activity has been found associated with the higher level of hs-CRP in the studies.[11] In this way activity of paraoxynase is essential to prevent the atherosclerosis. On the other hand, elevated level of thyroid hormones in hyperthyroid induce formation of free radicals as well as lipids peroxidation which results in atherosclerosis.[12] Nonetheless, various studies suggested that increased level of thyroid hormones are associated with decreased activity of serum paraoxynase.[13,14] Besides this high level of thyroid hormones in hyperthyroidism causes increased excretion of serum cholesterol and increased turnover of LDL characterised by decreased cholesterol, LDL and HDL levels. Decreased level of Paraoxanase in hyperthyroidism may be secondary to decrease of HDL as paraoxynase is found in HDL.[13,15]

However, contrary to the present study Lee et al,[16] observed there was no correlation between fT4 and hs-CRP as hs-CRP level was not a sensitive marker for metabolic changes due to higher thyroid hormones. Moreover, Jublanc C et al,[17] demonstrated there was negative correlation between hs-CRP and fT4 in hyperlipidaemic euthyroid patients.

However, finding of the present study are consistent with the previous studies where a strong relation of hyperthyroidism and hs-CRP have been observed.[7,8,10] Overt hyperthyroidism accelerate cardiovascular diseases and ischemic heart disease as it has been associated increased level of CRP as well as atherosclerosis.[1]

CONCLUSION

Finding of the present study suggest that hyperthyroidism is associated with low grade inflammation which leads to the development of atherosclerosis. Moreover, hs-CRP can be an important biomarker for the atherosclerosis in hyperthyroid patients. Further, more researches on larger population are warranted to establish the relationship between hs-CRP, hyperthyroidism and atherosclerosis.

LIMITATIONS

There were several limitations in the present study. First small size of population, second evaluation hyperthyroidism according to duration was not done. All these factors could be effect the level of hs-CRP.

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