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Original Article

ASSOCIATION OF THYROID HORMONE WITH LIPID PROFILE IN PATIENTS VISITING DISTRICT RAWALPINDI HOSPITAL, PAKISTAN

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ABSTRACT:

Current study aimed to examine the association of thyroid hormone with lipid profile in hospitalized patients. 5 ml venous blood sample was collected for evaluation of thyroid and lipid profiles. The study was conducted during January to June 2023 in Rawalpindi Institute of Cardiology (RIC), Rawalpindi, Pakistan. A total of 200 patients were recruited, among these 68 (34%) were females and 132 (66%) were males. On the basis of family history 64 (32%) patients had a family history of heart diseases, while 136 (68%) did not report any such history. The higher proportion of patients had hypothyroidism as compared to hyperthyroidism. Thyroid disorders along with lipid profile have greatly affected the cardiovascular system, consequently the rate of cardiac diseases has increased. The change in thyroid hormone levels can also affect lipid profile which will be directly affecting cardiovascular system even in low risk patients such as those without family history of cardiovascular diseases and without personal history of hypertension and diabetes mellitus. Thus it is essential to evaluate such relationship.

Keywords: Hypothyroidism, dyslipidemia, hyperthyroidism, triiodothyronine, lipid profile

INTRODUCTION

Thyroid hormones (TH) impact almost every organ function and have a broad influence on human body. The thyroid hormones play key role in regulating metabolism. Thyroid hormones affect blood pressure regulation, energy expenditure, and the metabolism of lipids and glucose in different ways (1). Over previous three decades, the incidence of metabolic syndrome has increased globally, rising from 1.1% in 1980 to 3.85% in 2015. Between 1990 and 2015, there was a 28.3% increase in the worldwide risk of mortality due to high body mass index (BMI)(2). Growth, development, and metabolism are all significantly regulated by TH, which is also crucial in controlling anabolism and catabolism of fats (3). The effects of hypothyroidism on blood lipid profiles are distinct. It has been reported that individuals with Thyroid Stimulating Hormone (TSH) >10 mLU/L have higher levels of ApoB-containing lipoprotein cholesterols as compared to the individuals with TSH 4.0–10.0 mLU/L (4, 5).

The levels of ApoB-containing lipoprotein cholesterols are always positively associated with the circulating TSH level, regardless of thyroid function (6,7). Accordingly, the likelihood of developing dyslipidemia increases with a higher TSH level (8, 9). Diabetes mellitus was also linked to a significantly higher risk of cardiovascular illnesses, especially type 2 diabetes, which was primarily linked to lipoid abnormalities. Notably, compared to the general population, diabetic patients had a higher frequency of thyroid dysfunctions (10). The present study was aimed to evaluate the association of thyroid hormone with lipid profile in hospitalized patients.

METHODS:

The study was conducted during a period of six month, from January 2023 to June 2023 in Rawalpindi Institute of Cardiology (RIC), Rawalpindi, Pakistan. For this study the individuals were selected who visited to the hospital with the complaint of cardiac origin with and without family history between the ages of 40 to 80 years. For all patient 5 ml venous blood sample was collected for evaluation of the thyroid and lipid profiles. The collected blood was allowed to clot by placing in a rack at room temperature for at least 30 minutes and maximum for 1 hour. Then it was centrifuged at 3,000 rpm for 5 minutes, and the separated serum sample was stored at -20 °C.

Biochemical analysis

The clear serum obtained from the blood was analyzed for TSH, and both thyroid hormones including Triiodothyronine (T3) and Thyroxine (T4) by using the chemiluminescent micro particle immunoassay (CMIA) technology. Lipid profile (cholesterol and triglyceride) were analyzed on Backman Coulter automated analyzers AU5800 and AU700 (Beckman Coulter, Inc., Crea, CA) by enzymatic photometry.

Statistical analyses

The Statistical Package for Social Sciences (SPSS software version 20.0) was used to analyze the collected data. A t-test was employed to compare the variables and a p- value <0.05 was considered statistically significant.

RESULTS:

A total of 200 patients were examined, among these 68 (34%) were females and 132 (66%) were males. On the basis of family history 64 (32%) patients reported to have positive family history of cardiac disease, while 136 (68%) denied any such history. The higher proportion of patients were found to have hypothyroidism as compared to the hyperthyroidism (Figure 1). In both males and females, the TSH (mean = 2.958) showed positive correlation between HDL-C (p=0.965, r=0.003), LDL-C (p=0.37, r=0.006), TG (p=0.16, r=0.095) and cholesterol (p=0.048,r=0.0597). In both the triiodothyronine (r=0.1490) there is positive correlation between cholesterol and positive correlation between HDL-C(r=0.1024), LDL-C(r=0.1205) and TG (r=0.2016). There was positive correlation between thyroxin (p= 0.14, r=0.1029) and HDL-C, TG (r=0.0475) and correlation between T4 and LDL-C is (r=0.05934) and cholesterol is (r=0.08468). Association between T3, HDL-C and TG considered statistically significant. Myocardial infraction had highest values with 20 (60.00%), while heart failure has lowest values with 1 (0.50%) respectively. During examination only 70 (35%) patients were smoker, while 130 (65%) were non-smoker (Table 1).

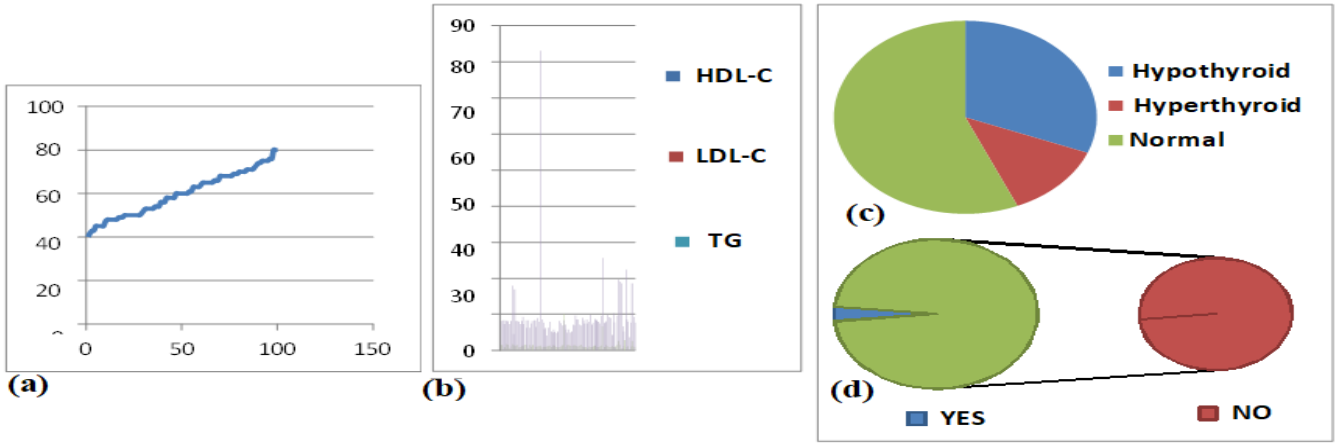

Figure 1. (a) Age of patients between 40 to 80 years; **(b)** Different values of lipid profile; **(c)** Number of patients with hypothyroid, hyperthyroid and normal; **(d)** Family history of dyslipidemia.

Table 1. Correlation of thyroid hormones with HDL-C, LDL-C, TG, cholesterol and number of patients with heart diseases.

Para	HDL-C *(p value)*	LDL-C *(p value)*	Triglyceride *(p value)*	cholesterol *(p value)*	% of heart disease in patients	
	(r)	(r)	(r)	(r)		
TSH	+0.0031 (0.9652)	-0.0627 (0.3777)	-0.0991 (0.497916)	-0.048 (0.497916)	Angioplasty 15 (7.50%)	Heart failure 1 (0.50%)
T4	+0.1343 (0.5796)	+0.0922 (0.1941)	+0.0434 (0.541)	+0.0251 (0.072424)	Arrhythmia 9 (4.50%)	Myocardial infraction 120 (60.00%)
T3	0.1024 (0.1490)	+0.1205 (0.8919)	+0.2017** (0.004*)	+0.0884 (0.213217)	Chest pain 13 (6.50%)	Unstable angina 11 (5.50%)
* p<0.05 statistically significant; ** p<0.01 statistically significant. Para: Parameters; HDL-C: High density lipoprotein cholesterol; LDL-C: Low density lipoprotein cholesterol; TSH: Thyroid stimulating hormone; CAGB: Coronary artery bypass graft surgery.					CABG 7 (3.50%)	Suspected 24 (12.00%)
					% Smoker 70 (35%)	% non-smoker 130 (65%)

DISCUSSION

The level of thyroid hormones, especially hypothyroidism, the thyroid stimulating hormone level is significantly more as compared to normal subject. The locality and the environment are also affected the case profile of the patients as well as the controls. This hypotheroid state may be influenced by the altitude of the area of the samples. The study11 thyroid dysfunction was found in 22% of the 197 participants. Of these, 86 (35 females and 51 males) had a metabolic syndrome diagnosis, while the remaining 111 subjects (51 males and 35 females) were regarded as controls. In participants with metabolic syndrome, most of the hormone such as T3, and TSH were considerably higher ($p<0.001$) as related to without metabolic syndrome. Regarding the lipid profile, the individuals with metabolic syndrome had triglycerides of 262.8±112.3 mg/dL, which was substantially greater ($p<0.001$) than the triglycerides of those without metabolic syndrome (137.9±19.01 mg/dL). The group without metabolic syndrome had serum HDL levels that were considerably higher ($p<0.001$) at 50.5±3.9 mg/dL compared to 43.4±5.2 mg/dL in the metabolic syndrome group. Subjects with metabolic syndrome had TSH levels 5.3±3.4 µl/mL, which were substantially higher ($p<0.001$) than those without metabolic syndrome (2.6±1.4 µl/mL).

According to a study12 the median age for men was 39 (35–47) years, while the median age for women was 36 (32-43) years. 13% had hypothyroidism and 3% had hyperthyroidism; subclinical hypothyroidism accounted for 19% of thyroid dysfunction cases. Between hypothyroid and euthyroid patients, there were very significant variations in total cholesterol and thyrotrophin levels, with the former having more atherogenic profiles. When dyslipidemia was evaluated using logistic regression, a significant correlation with hypothyroidism was found (3.24(1.81-5.81), $p<0.001$). A total of 324 people were evaluated by13 the T4 was requested for each subject whose TSH was abnormal. Three categories were used to group the participants: euthyroid (226 individuals), subclinical hypothyroidism (75 individuals), and overt hypothyroidism (23 individuals). The lipid profile while fasting was assessed for cholesterol, TG, LDL, and HDL. Between research groups, there was a significant difference in LDL, TG, and cholesterol, but not in HDL (euthyroidism, subclinical, and overt hypothyroidism). Compared to euthyroidism, overt hypothyroidism demonstrated a substantial difference in LDL, TG, and cholesterol.

The study had a small sample size and only thyroid hormones and lipid profiles were assessed without taking potential confounding factors into account is taken as the limitations of the study. However, the study has provided evidence to explore thyroid hormone as one of the underlying cause for metabolic syndrome and cardiac abnormalities.

CONCLUSION

In conclusion thyroid disorders along with lipid profile has greatly affected the cardiovascular system, as a result heart diseases arise. Thyroid hormone plays important role in regulation of metabolism. So, with the increasing activity of thyroid hormone, marked changes in production of thyroid hormone occurs causing impact on the metabolism. In the thyroid patients when the level of thyroid hormone is altered then as result the dyslipidemia occurred. Dyslipidemia is metabolic irregularity in the thyroid patients and made the end result of the thyroid with the lipid metabolism that leads to the change in the cholesterol, triglycerides and the phospholipids. Further studies are required to establish string causal relationship.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

The study was approved by local research ethics committee.

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